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The Telephone Central Office of Paris.

(*Continued.*)

(*Translated for the* REVIEW *from La Lumiere Electrique.*)

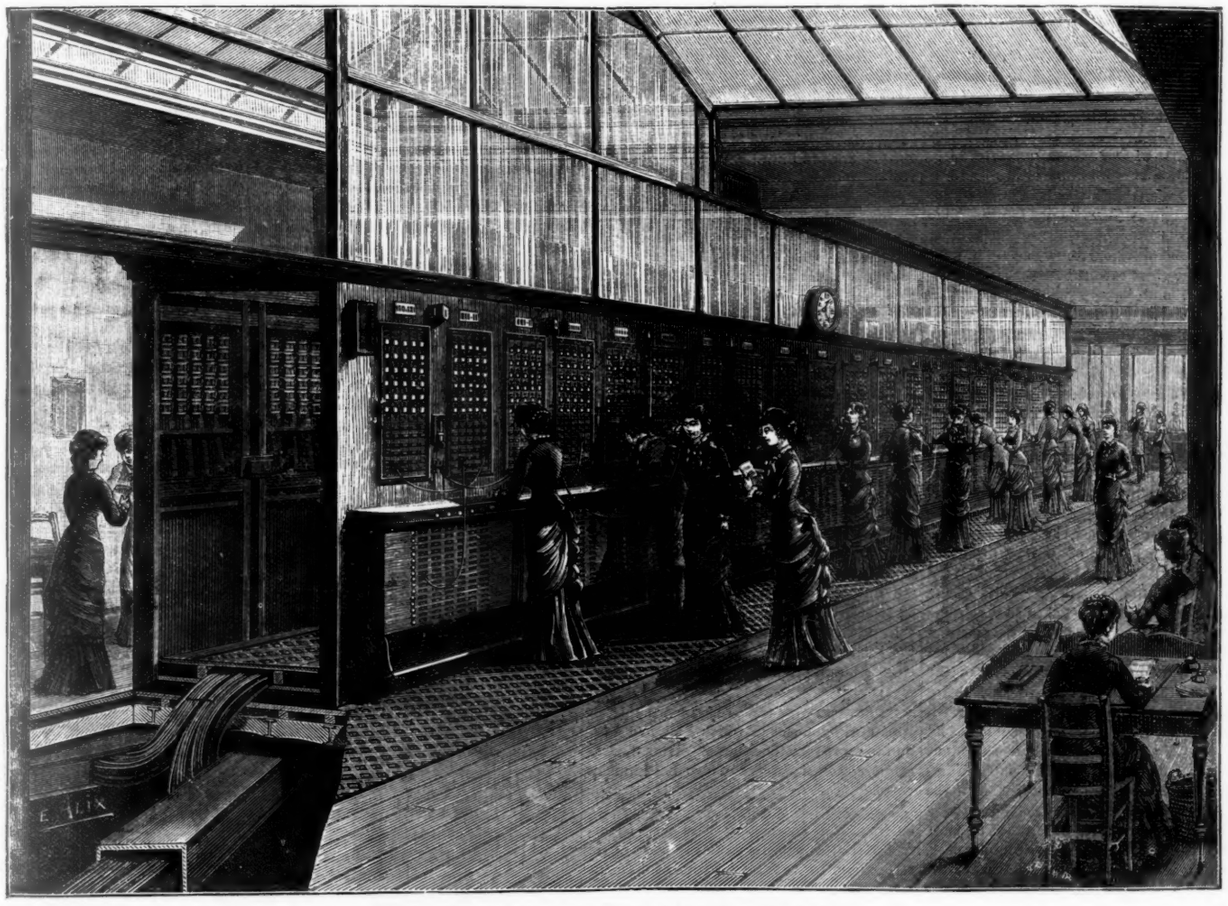
The jack-knife switches, by means of which connections are made between subscribers and between the central offices, have been constructed after a fashion which anticipates an installation which has not yet been made; but as it will doubtless be executed in the near future we will describe the jack-knife as it is now:

It is a piece of copper composed of two plates insulated from each other, and which are placed in connection, one with the line to the subscriber and the other with the annunciator which we have just described, and which is already in connection either with the earth or with the return wire of the circuit, in cases where metallic circuits are employed These plates are furnished underneath with two springs, which normally rest in opposite directions on a contact in the local circuit of the annunciator; but this contact can be interrupted by an ivory plug, whose functions we will now describe.

The double plate, of which we have just spoken, is pierced with two holes whose diameter is different in the two plates, and which are intended to receive, to establish connections, the plugs already alluded to. These holes are provided laterally, in the thickness of the plates, with a little opening in which is placed an ivory pin at the extremity of the plug. The head of this pin rests separately on the two springs and separates them from the co tact at the moment that the plug is placed in the hole. Naturally, the pins correspondent to different plates and different holes. Thus, the pin which corresponds to the spring of the anterior plate is put into the left-hand hole, and the second pin, which corresponds to the second spring, is placed in the narrowest portion of the hole at the right, which is made in the back plate. The plugs intended to be placed in the jack-knife switches are composed of two metallic portions, each insulated from the other and attached to the same handle. One of these is attached to one conductor of a flexible cord, and the other, which surrounds the former, is separated from it by ebonite insulation, is connected with the other wire of the flexible cord. When the plug is placed in either of the two holes, the subscriber's wire continues through the flexible cord back, either to the portable telephone in the central office or to the line of the subscriber with whom he is connected.

We have shown, in our preceding article, how the service was carried on in simple offices, but in double offices, like that in the Avenue de l'Opéra, it is a little more complicated, and we shall therefore add a few additional particulars on this subject.

When a subscriber A, wishes to speak to a subscriber B, he first calls, as we have seen, the central office with which he is directly connected, by pressing on his call-button. At the central office the annunciator of his line falls and operates the bell, thus forewarning the operator of the central office; she replaces the annunciator shutter, and then the two exchange a conversation which has for its result the connection of the two subscribers. But here two cases may be presented; the subscriber called may be directly connected with the same central office as A, or he may not. In the first case, the central-office operator calls up subscriber B, and as soon as she has received his response she makes the connection. When the two subscribers have finished speaking, they should announce that fact to the central office by pressing their call-buttons, which causes the shutter of the annunciator at the central office to drop. In the second case, the subscriber A must ask the central office with whom he is directly connected to put him in communication with the central office with which B is connected, and to secure this connection, it is first necessary to connect, as we have seen, the two central offices together by means of the auxiliary or trunk-wires, which have their switches on the special boards, and on the lower boards in the central offices. These switches, on the lower boards, have only one hole, and are arranged like the rounds of a ladder to the number of eighty, one under the other, in fifteen horizontal ranges, each composed of six plates. The



(FIG. 3.)—THE CENTRAL TELEPHONE OFFICE OF PARIS, FRANCE.

first four horizontal ranges are used for auxiliary (trunk) wires, the following eight for the lines of subscribers of the same office; I m from the board in question, and the three last ranges for the lines of subscribers belonging to the contiguous central office, or twin office, as it is called.

All the switches are connected together, the first *A*, of each group of boards and of each horizontal range, to all the jack-knives of the same name *A*, and of the same situation in the other groups of boards, so that the connections are only made on the same horizontal line; and in each one, all the switches of the column *A* are metallically connected, the same is the case with the second column *B*, and so on. Let us begin by following the *manœuvers* which are gone through to connect the subscribers of the bureau which we are describing. The 8 ranges of jack-knives set apart for these connections are numbered from 1 to 8, and each one corresponds to one of the groups of two boards. Let us suppose that a subscriber of board 101 to 125 calls for a subscriber of another group. The operator will put a flexible cord with plugs between the jack-knife of the subscriber, who is, we will suppose, the first of the fourth line, and one of the jack-knives of the lower board of line No. 3, reserved for the group of board No. 3, which we are discussing. Now the plug has been placed in the jack-knife 2 of the line No. 3. That would lead us to think No. 1 was occupied when the connection which we are discussing was made, for there is no reason to use No. 2 if No. 1 is free. If the subscriber belongs to the group of boards No. 1 the operator goes there and connects the jack-knife No. 2 of board No. 1 by a flexible cord, and plugs with the jack-knife of that subscriber, after having first called him and satisfied herself that he is in his office. It will be seen that, in this case, in place of a single switching, two will be required to establish the communication; there are two cords to be put in u-e. This procedure is often made in very little time, provided the operators know exactly in what part of the office each subscriber's jack-knife is placed, and they generally succeed in learning that very quickly.

Let us now follow the arrangements required to connect a subscriber of the office which we are describing, with a "twin" office We have for this service, as has been before stated, three ranges of switches which are designated by three colors, red, green and brown, given to the circular labels which precede each horizontal range.

These three lines lead to a board of 25 numbers, which is designated by the three colors above men ioned, and placed in the middle of the length of the partition, to diminish the distance to be traversed. If a subscriber of the second jack-knife of the fourth line of the board (1 5 to 150), asks for a subscriber of the "twin-office," the operator puts the flexible cord and plugs between his jack-knife and one of the jack-knives of the red line, which is the first of the three. That done, the operator goes to the tri-colored board, and calls the twin-office by one of the jack-knives which she finds unused; when the response has been received she connects her subscriber with the twin-office, which continues the operation in the same manner. The third range of jack knives composed of four horizontal ranges connects, as we have already stated, to the trunk wires. These four lines are designated by discs of different colors, white, yellow, blue and block. These four ranges connect to four boards of 25 numbers, each one designated by one of the colors indicated. The calls made by other central offices are received at one of these four boards.

Let us suppose that one of the annunciators of the blue board falls, the operator will put the cord between the jack-knife of the number which has fallen, and one of the jack-knives of the line marked blue, then she will take it back to the board in which is connected the subscriber who has been called.

On the contrary, the calls of a subscriber of the office which we are describing, are transmitted by the range of jack-knives carrying the number of the group of two boards in which he belongs, as we have explained in the case where the call is addressed to a number in the same office.

The service is carried on in the office of the Avenue de l'Opera by thirty-three young ladies unequally distributed, it is true, between the two contiguous offices, considering that one is more surcharged than the other, on account of the stock exchange business. As will be seen, all of the combinations are simple and practical, and we very much doubt whether anything better can be made.

Nevertheless we hear that Mr. Berthon has solved, in an extremely simple manner, the problem of the suppression of connections with the earth on the subscriber's wires to indicate the cessation of conversations, and that his system will allow at the same time, direct calls between subscribers, a very important result, for it will obviate the necessity for the subscriber's waiting, with the apparatus to the ear, for the end of any search for information asked for by one or the other of the subscribers.

We cannot, for reasons affecting the patents, describe this system at present, but we are justified in believing that it will furnish perfectly satisfactory results.

DE MAGNEVILLE.

(*To be continued.*)

The First Telephone.

BY PROF. SILVANUS P. THOMPSON.

(REPRINTED FROM THE PROCEEDINGS OF THE BRISTOL NATURALISTS' SOCIETY.)

On the 12th of May, 1862, there met together in a fine old hall in the city of Frankfort-on-the-Main a crowded audience eager to see and hear the latest scientific invention expounded by its inventor.

The occasion was the meeting of the Free German Institute (Freies Deutsches Hochstift)—a sort of literary and philosophical society, which has since domiciled itself in the historical old house where Goethe was born.

The invention which attracted so notable a crowd was the telephone. The inventor was Philip Reis, a teacher of natural science in Garnier's Institute, a flourishing boys' school at Friedrichsdorf, near Homburg.

On one occasion previously had the telephone been publicly exhibited, namely, at a meeting of the Physical Society of Frankfort, on the 22d of October in the preceding year.

In the journal of the Frankfort Society (*Jahresbericht des Physikalischen Vereins zu Frankfurt am Main*) for 1860-61, page 57, may be found the memoir of Philip Reis on the subject under the title "On Telephony by the Galvanic Current."

In this memoir, which shows a marvelous precision and a grasp of the subject that excites admiration and wonder, the author says:

"I have now succeeded in constructing an apparatus by means of which I am in a position to reproduce the tones of divers instruments, and even to a certain degree the human voice."

The inventor further says: "Since the length of the conducting wire may be extended for this purpose just as far as in direct telegraphy, I give to my instrument the name 'telephone.'"

Toward the end of the memoir it is stated that until now it had not been possible to reproduce the tones of human speech with a distinctness sufficient to satisfy everybody—adding:

"The consonants are for the most part tolerably distinctly reproduced, but the vowels not yet to an equal degree."

The author of the memoir in which these statements occur had been led to his invention by a remarkably suggestive line of thought. He had wanted an instrument to transmit electrically everything and anything that a human ear could hear. Accordingly he took the human ear itself as a model.

"How," he argues, "could a single instrument reproduce at once the total actions of all the organs operated in human speech? This was ever the cardinal question. At last I came by accident to put this question another way: How does our ear perceive the total (or resultant) vibrations of all the simultaneously-operant organs of speech?"

He then goes on to describe the action of the auditory ossicles when the ear is made the recipient of sound; pointing out how they execute movements and exert forces upon one another in proportion to the condensations occurring in the sound-conducting medium and to the amplitudes of vibration of the tympanum. Having stated this law of proportion between the cause and its effect he goes on to speak of the graphic method of representing varying forces, such as those of sound-waves, by curves; and emphatically lays down that the ear is absolutely incapable of perceiving anything more than can be expressed by such a curve. After giving samples of undulatory curves corresponding to musical and to discordant sounds, he makes the following significant remark:

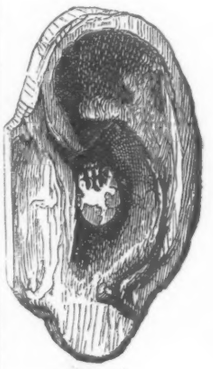


FIG. 1

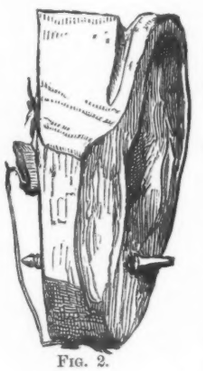


FIG. 2.

"So soon, therefore, as it is possible at any place and in any manner, to set up vibrations whose curves are like those of any given tone or combination of tones, we shall then receive the same impression which the tone or combination of tones would have produced upon us. Taking my stand upon the preceding principles, I have succeeded in constructing an apparatus," &c.

He concludes his paper by saying that the newly-invented phonautograph of Duhamel may perhaps afford evidence as to the correctness of the views which he has asserted respecting the correspondence between sounds and their curves.

The actual apparatus figured in this memoir and exhibited to the Frankfort Society in October, 1861, is now in my possession, and I have also temporarily intrusted to me a still earlier experimental telephone, made by Philip Reis, in the form of a model of the human ear.*

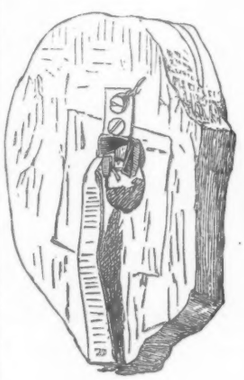


FIG. 3.

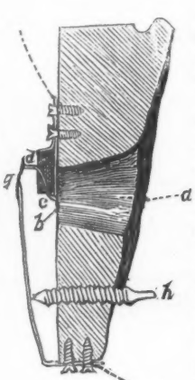


FIG. 4.

This interesting instrument is depicted in its actual condition and size in Figs. 1, 2 and 3, and in section in Fig. 4. It is carved in oak wood. Of the tympanic membrane only small fragments now exist. Against the center of the tympanum rested the lower end of a little curved lever of platinum wire, which represented the "hammer" bone of the human ear. This curved lever was attached to the membrane by a minute drop of sealing wax, so that it moved in correspondence with every movement of the tympanum. It was pivoted near its center by being soldered to a short cross-wire serving as an axis. The upper end of the curved lever rested in loose contact against the upper end of a vertical spring, about one inch long, bearing at its summit a slender and resilient strip of platinum foil (see Fig. 4). An adjusting screw served to regulate the degree of contact between the vertical spring and the curved lever. Conducting wires by means of which the current of electricity entered and left the apparatus were affixed to screws, in connection respectively with the support of the pivoted lever and with the vertical spring. A springy strip of platinum pushed against the end of the pivot of the lever (as shown enlarged in Fig. 5) to insure good electrical contact.

If now any words, or sounds of any kind, were uttered in front of the "ear," the membrane was thereby set into vibrations, as in the human ear. The little curved lever took up these motions precisely as does the "hammer" bone of the human ear; and, like the "hammer" bone," transferred them to that with which it was in contact. The result was that the contact between the upper end of the lever and the spring was caused to vary. With every rarefaction of the air the membrane moved forward, and the upper end of the little lever moved backward, and pressed more firmly than before against the spring, making better contact, and allowing a stronger current to flow. At every condensation of the air the membrane moved backwards and the upper end of the lever moved forward, so as to press less strongly than before against the spring, thereby making a less complete contact than before; and, by thus partially interrupting the passage of the current, caused the current to flow less freely. The sound waves which entered the air would in this fashion throw the electric current, which flowed through the point of variable contact, into undulations in strength. Reis himself termed the contact part of his telephone an "interruptor." That it was not intended to operate as an abrupt make-and-brake arrangement, as some persons have erroneously fancied, is evident; firstly, because the inventor introduced delicate springs to give a following contact (like that in Blake's well-known "transmitter"), and so prevent abrupt breaks from occurring; secondly, because abrupt breaks would have violated the fundamental principle to which he refers in the sentence immediately preceding his description of the instrument shown to the Frankfort Society, namely, that of creating tones whose curves were like the undulatory curves imparted at the transmitting end of the instrument; thirdly, because (in another article) he described his instruments as opening and closing the circuit in proportion to the sound wave, which, obviously, an abrupt "break-and-make" apparatus without a spring contact could not possibly do. The mechanism which Reis thus invented—and which is substantially alike in all his instruments—might be appropriately described as the combination of a tympanum with an electric current regulator, the essential principle of the electric current regulator being the employment of a loose or imperfect contact between the two

* The property of Leon Garnier, Esq., Director of Garnier's Institute at Friedrichsdorf, near Homburg, where Philip Reis was formerly teacher of natural sciences.

parts of the conducting system—those parts being so arranged that the vibrations of the tympanum would alter the degree of contact, or occasion an approach and recession of the atoms of the two surfaces, and so vary the resistance offered at the point of contact to the flow of the current.

The particular form of the instrument shown at Frankfort in 1861, and described in the *Journal*, is somewhat different from the "ear." The description is taken from the *Journal:*

"In a cube of wood there is a conical hole,

FIG. 5.

closed at one side by the membrane (made of the lesser intestine of the pig), upon the middle of which a little strip of platinum is cemented as a conductor of the current. This is united with the binding screw *p*. From the binding screw *n* there passes likewise a thin strip of metal over the middle of the membrane, and terminates here in a little platinum wire which stands at right angles to the length and breadth of the strip. From the binding screw *p* a conducting wire leads through the battery to a distant station." In the original instrument there is also an ad-

FIG. 6.

justing screw to regulate the contact, though this was not shown in the drawing in the Frankfort *Journal*.

The receiver used to reproduce the sounds transmitted by these telephones is also described in the memoir of Reis. It consisted of a steel needle surrounded by a coil of wire. This was at first set up—for the purpose of increasing the sounds by resonance—upon the top of a violin, as shown in Fig. 6; later it was mounted upon a pine-wood box, as in Fig 7; to which still later a lid of thin pine was added, against which the listener could press his ear. The sounds

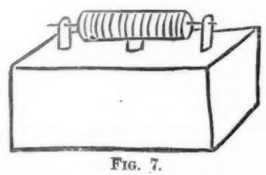


FIG. 7.

emitted by such a wire during magnetization and demagnetization were well known before, but to Reis is due the discovery that other tones than the natural vibration tone of the wire could be electrically imposed upon it by the varying magnetizing power of the current traversing the surrounding coil. Reis explained the reproduction of the transmitted sounds by supposing a magnetic attraction between the atoms of the steel wire to work synchronously with the fluctuations of the current. He later devised a different receiver, in which an electro-magnet was provided with an elactically mounted armature of iron attached to a light and broad lever, which it threw into vibrations corresponding to those of the original sound waves. With this apparatus, and a transmitter with a small curved lever, in shape like that in the "ear," he was able (see Kuhn's "Handbuch der Angewandten Elektricitätslehre," 1866, p. 1,021), not only to reproduce melodies with astonishing exactness, and single words, as in speaking and reading, less distinctly, but even to transmit the inflexions of the voice expressive of surprise, command, interrogation, etc.

Considering how far these early researches were carried, it is remarkable that their historic value has been so greatly overlooked. The transmitters which Reis devised embody—though their mechanical design is less perfect, and their performance consequently less certain—all the essential principles of the telephonic transmitters in use to-day, such as Blake's, Berliner's and Crossley's. The receivers devised by Reis, more particularly the second form, anticipate every principle essential in the more modern and convenient receiver of Graham Bell, having an electro-magnet combined with an armature capable of inductive action—*i. e.*, made of iron, elastically mounted, and having an extended surface. Bell made the very great improvement of uniting these three qualities, essential to the armature, in one, by employing as armature a thin, flexible, iron plate. It is but just to the later inventors to add that both Bell and Edison have explicitly referred to Reis's prior work, Bell even going so far as to name the pages of Kuhn's Handbook from which the preceding reference is taken.

Random Flashes from New England.

II.

THE SYSTEM OF THE NEW ENGLAND WESTON ELECTRIC LIGHT COMPANY—SPECIAL FEATURES AND IMPROVEMENTS IN ARC AND INCANDESCENT DEVICES.

In the work by which lighting by electricity has within the past few years grown from a doubtful experiment to an established system, the United States Electric Lighting Company has taken an active part. Its organization was effected in 1878, and entering the field side by side with the Brush light, it has secured a large business. It absorbed the Weston Electric Light Company, organized a year earlier; and the experimenters and electricians who are now permanently employed, and whose inventions and patents have become its property, had for several years been busy with a large amount of preliminary work. The names of E. Weston, Hiram S. Maxim and Prof. Moses G. Farmer are identified with numerous researches and improvements in electric lighting machinery, and the services of all three of these experts are retained by the company, while their inventions represent a large and valuable portion of its capital.

The breadth of the field covered by the patents thus secured has enabled the United States Company to undertake the development of both arc and incandescent lighting, believing, as have several other companies who have envied them the facilities enjoyed, that the greatest advantages may be secured by working the two in company. The business offices of the company are at 59 and 61 Liberty street, New York, and their factory at Newark, N. J., has within the past two years been greatly enlarged and fitted with all the modern appliances for electrical construction work. Three organizations—the New England Weston Electric Light Company, of Boston; the Rhode Island Electric Light Company, of Providence; and the Connecticut Electric Light Company, of New Haven—control the business of the system in New England. Under this arrangement, the Boston company own exclusive rights for all of New England, excepting the western part of Connecticnt and Pawtucket, R. I. Their sub-companies thus far formed cover Portland, Me.; Manchester, N. H.; Salem, Lowell and Springfield, Mass., and Newport, R. I., and in all these places the

WESTON ARC LIGHT

is said to be finding favor. Several improvements have been made within the past two years, and as some of these have attracted little notice in electrical journals, it will be found interesting to your readers to mention them somewhat carefully.

It should be remembered at the outset that the Weston light is produced by a current of low E. M. F., 30 volts per lamp being the standard, and that the arc is very short, the resistance of the lamp when in action being only 1.3 to 1.6 ohms, giving an intensity of 18 to 20 amperes—about two-thirds more than some others—thus circumscribing to some extent the distance ot which lamps may be placed from the generator, or rather the length of the circuit. This disadvantage has been overcome to some extent in practice by connecting two or more generators in series, thus occasionally raising the E. M. F. on long lines of 25 lamps or upward to 600 volts or more. The arrangements by which combinations of lines and generators are often made are novel, and merit a passing notice.

In the Boston station on Stanhope street there are now in use 25 10-light and one 20-light machines. These have been actuated by a compound Buckeye engine of 200 horse-power, and two more of the same size and style, with two boilers capable of running them, are now being placed in position. As thus equipped the 600 horse-power capacity promises to supply the needs of the station for some time. The dynamos are mounted on massive wooden bases, resting on blocks perhaps six inches thick, and are all of the distinctive Weston pattern, with 12 horizontal cylindrical electro-magnets, six above the armature uniting in a single pole piece, and six below, similarly arranged. The coils are connected in series, and the entire current is transmitted through them, while the commutators are of the type arranged helically on the shaft and separated by air spaces. Mr. Weston provides his generators with two sets of terminals, by which, from the top of the upper pole-piece, the line wires can be carried, in isolated plants, directly to the ceiling; or, as in this instance, a brass casting, conspicuously numbering the machine, is attached to the upper cups, and the wires lead from another pair below to their place beneath the floor, and thence to a switch-board, where each wire terminates in a brass socket drilled to receive a tapered plug. On leaving the machine one of the switch-board wires (as the negative) includes a flexible cord, brass plug and socket. To the other terminal, which is permanently joined to its switch-board connection, is also attached a second cord and plug, which, when the negative is disconnected by the removal of its plug, may be placed in the socket, and a closed loop from the switch-board, not including the generator, be thus formed. These are the conditions when the dynamo is not in use On starting the cross-connecting plug is removed to a non-conducting socket, and the other terminal attached, completing the circuit through the field coils and armature.

The board itself consists of a horizontal central shelf, on which rest, from 4″ to 6″ apart in either direction, two rows of sockets connected with the dynamo conductors, those in front being negative, the rear line positive. Above this is a vertical section bearing similar rows forming the positive ends of line wires, and below another section of corresponding negative terminals. When, as ordinarily, a dynamo is to be coupled with its circuit, two flexible cables with plugs, connect a front shelf socket to the proper one below, and the corresponding rear socket to the other end of the line above.

If it is desirable to couple two dynamos in series a special **T**-shaped plug or cross-bar is laid diagonally from the negative of the first to the positive of its nearest neighbor, or by means of one of four connecting wires or bars attached to corresponding sockets at the extreme top and bottom of the board to any machine on the lathe.

At one side, but within plugging distance, are sockets leading to ground, galvanometer and magneto tester, while a pair of lines connect any machine or circuit with the laboratory at pleasure.

The lamps are stated to give 500 to 1,000 candles of light, and require about 1-horse power each. This ratio is admited to be much smaller than that claimed by numerous other companies, but of course interests mainly those concerned in the illuminating business, and is without doubt a more honest statement than many others when judged by the standards adopted for incandescent measurement, which is equally applicable to arc lamps.

The relatively short arc also varies through a greater proportionate range of resistance than in systems of heavier currents. Hence the action of the lamps in maintaining a steady light has been found to depend more entirely on their individual construction and the degree of skill manifested in their case.

In the station we are describing the expert watchfulness of Mr. H. S. Stevens, one of the company's ablest practical electricians, seems to render the steadiness of the light almost phenomenal, while on the same circuits, at other points, the frying of the lamps is unpleasant and the flickering positively painful.

The low E. M. F. to which these results are rightly chargeable has, on the other hand, the advantage of being easily confined to its conductors, and so far less dangerous to those who manage and use its machinery and less likely, even with its increased quantity, cause fires and similar accidents.

MAXIM INCANDESCENCE.

The lamps of Hiram S. Maxim, widely known as an active worker in the incandescent field, can also be seen at this station, two 100-light machines being now employed in operating fifty lamps at the Hotel Brunswick. Though quite near in direct distance, the hotel can be reached only by a considerable stretch of ordinary wire on a circuitous route across the Boston and Albany Railroad, and as the installation is a trial one, the company have coupled the machines in their hands in series to deliver 75 amperes of current through the abnormal circuit.

The present results are stated to indicate six lamps of 25 candles each per horse-power, the lamps being of 40 ohms resistance and taking a current of 60 volts. Theoretically these conditions would give a possible result of 8.3 lamps per horse-power, which has according to the statement of Mr. Stevens, been closely approximated. But Mr. Weston recognizing the difficulty of distributing 1.5 amperes of current per lamp, so as to successfully operate a central station business, is working in the direction of higher resistance, and by forming a filament of gun-cotton, chemically treated in a way, of course, known only to himself, he claims to have secured a carbon of 75 ohms resistance, which he expects with an E. M. F. of 52.5 volts, will by a current of 0.7 amperes also give 25 candles of light.

The theoretical efficiency possible under these conditions is nearly 20.3 lamps or 500 candles of light per horse-power, which it is hoped will be so nearly attained as to give 9, 10 or possibly 11 lamps or 275 candles per horse-power.

This experimental carbon is expected to combine with increased resistance and higher efficiency the desirable qualities of geater firmness and uniformity of structure, a lessened liability of breakage by accident and a longer life than any filament now in use.

The Maxim is sold as a 25-candle lamp, but whether this illuminating power applies to the photometric measurement on the face of the carbon or to the average light, measured at intervals of 10° on the circumference of its globe, is a matter of difference of opinion on the part of the officers of the company. Taking the statement of the electricians and assuming the lamps to give normally 25 candles from its face, the power from its edge is about 6 or 8 candles, and the average at 52° from the edge, 18.7 candles.

With this point in view it is seen that the Paris test, made in all cases at 45° from the edge of the carbon, gave the Edison lamp an

advantage over the Maxim, as this angle represented the greatest efficiency of the former and only about 75 per cent. of that of the latter.

On the other hand, a private test made at the Institute of Technology recently, though probably by an unprejudiced person, showed an advantage to Maxim in measuring on the face of the filaments, giving one its full efficiency, the other about 60 per cent. thereof. As the recent attempt at a careful test at Lowell was abandoned through the failure of the parties to agree upon a just basis of calculation, no really satisfactory trial of the efficiency of these rival systems has yet been secured.

The real value of any lamp must, however, be ultimately decided by the actual work it will do in the hands of an inexperienced and unprejudiced public, and its commercial success must be detern ined by the verdict of practical people who propose to rely upon it as a measure of illumination.

The Maxim plant at the Hotel Brunswick is the only one now exhibited by the Weston Company in Boston. Just at present it is attracting unusual interest on account of the introduction of several of the new lamps on the circuit of the Weston arc lights with which portions of the building and approaches are illuminated.

The resistance of the sample lamp now being placed is 70 ohms, and a group of 12 of these in derivation takes the place of one arc light. It is too early yet to speak of the result.

The generator devised some years ago by Mr. Maxim with a separate exciter and its automatic regulator have been dropped, and a modification of one style of the Weston arc light machine wound for quantity introduced in incandescent work.

It was shown by Wheatstone as long ago as 1867 that a generator might be constructed having its field coils wound in derived circuit, and the Siemens shunt generator of 1879 showed that this principle would operate in arc light machines as an automatic current regulator.

It has never before been claimed, however, that a dynamo for incandescent work, the lamps being placed in multiple, could be operated from the lowest to the highest resistance of the exterior circuit without a proportionate change in the field circuit with equalized candle-power in the lamps whatever their number and with safety to the generator.

In their latest circular the company make the following claim: "As the number of lights in circuit varies, it is necessary to vary the quantity of the current generated, in order to prevent accidents to the lamps, and to keep them at a uniform brilliancy. This has been accomplished in other systems by manual adjustment of the machine from time to time by an attendant. This is obviously objectionable, as it involves the presence of an attendant at the machine, and accidents may occur, and, in fact, do occur in practice from lack of attention. Mr. Weston, however, has been able, by a peculiar construction of the machine itself, to make it entirely self-regulating without the use of any special mechanism. This operates with such quickness and precision that with one hundred lights, for example, in circuit, ninety nine may be instantly turned out without affecting the brilliancy of the remaining light, and without any change in the adjustment of the machine. This is the only machine ever produced which accomplishes this most desirable result."

The above comprehends all which can be officially secured regarding this device or method, as none of the electricians will make any explanation of its details. It is difficult, however, to understand how it can be accomplished except by making the field cores small and the resistance of their coils unusually high. Assuming, for a moment, a machine with this arrangement, the point of saturation will be approached when the greatest number of lights is burning, the external resistance is consequently least, and the smallest possible percentage of the total current is passing through the derived circuit of the coils. As lights are turned off, the external resistance increases, also the current passing through the fields, until, when 99 out of 100 lamps are extinguished, a large proportion of the entire current is expended on the magnets, which are not, however, increasingly affected, as the quantity necessary to produce complete saturation has been greatly exceeded, and the question becomes one of capability on the part of the field coils of carrying so much without injury, and of the expenditure of a very large amount of power in the operation of the remaining lamp. Of course, such a machine, while possessing advantages for an isolated plant, where the number of lamps is nearly a fixed quantity, would be extremely expensive in central station lighting, from the great amount of energy which would often run to waste.

The original adjustment of the Weston generator to its maximum of work, as well as any subsequent change in the candle-power of the lamps, is accomplished by an ordinary resistance box, like that used in other systems.

Mr. Weston's long and valuable experience as an electrician has proved of incalculable advantage to his company. His attention to the details of the system is illustrated in the careful adaptation of the lamp to its current, and the devices which have been arranged for regulation and safety. Among these are the high-resistance coil, which, by a switch, is thrown into the field circuit before making or breaking connection with the machine, and prevents shocks and sparks—an indicator which, after a variation of current strength, marks a deflection on a dial, or closes the circuit of an alarm bell; an ingenious cut-off box placed in the circuit at the point of entering any building, and always indicating whether the lamps are "on" or "off;" and the various sizes of fusible cut-off for maxim circuits composed of an alloy melting at a low temperature.

The electro-depositing machinery made by this company bears a reputation for vigorous and reliable action, and forms an important branch of their business. RAMBLER.

Boston, June 30, 1883.

A Successful Electric Light.

THE BRUSH LIGHT SYSTEM AND THE SWAN LAMP EXHIBITED.

Hundreds of people were attracted on Friday last by the light reflected from electric lamps stationed at various points in the business portion of the city of Syracuse. The lamps burned with a brilliancy and a steadiness in marked contrast with the fitful and flickering rays emitted by the electric lamps that were burned in the streets for a time during the winter months.

Those who cared to satisfy their curiosity learned that the light generated was furnished as an experimental test under the Brush-Swan system.

While thirty-five lamps were burning in the streets, a company of gentlemen met at the Globe Hotel where a test was made in applying the light to domestic purposes and where the Swan lamp and the apparatus used in the Brush storing system were explained. Among those present at the Globe Hotel were Mayor Doolittle, of Utica; Silas B. Dutcher, formerly Superintendent of Public Works, and several gentlemen of this city, who were especially interested in seeing a practical test of the Brush-Swan process.

The exhibition was certainly a brilliant success.

In a small room on the first floor of the Globe stood a box about 12x6 feet. In this box had been placed the batteries, which had been charged during the day with a supply of electricity for use at night in the hotel. A simple apparatus of very small compass had been placed over the box, and through this apparatus during the day the subtle fluid had been transmitted along a wire extending from the works of the Chilled Plow Company where power is supplied. Long before nightfall the batteries had been sufficiently charged and, independent of the power in the plow works or the connecting wire, they were prepared to furnish light for the hotel.

The battery amounts, in fact, to a storehouse. It is supplied with lighting force just as a cooler is filled with ice and is ready to furnish refreshing drink, or as the householder's cellar is stored with a season's supply of fuel. By means of the famous Swan lamp this supply of electricity was used last night in lighting the lobby of the hotel where the lamps burned brightly until 10 o'clock.

The Swan lamp is small and delicately constructed, being readily adapted to use on chandeliers or brackets intended originally for gas. The light generated last night was remarkable for its softness and brilliancy. It did not dazzle as do most electric lights, and it burned for hours with a steadiness more even, in fact, than that of the ordinary gas jets.

Meanwhile forty lamps attached to the batteries in the store-room were used to demonstrate the ease with which the Brush-Swan system is handled. The constancy of the power, the brilliancy of the light which remained unchanged whether one lamp or forty lamps were buring, the independence from accident to the generating power or the connecting wire, the simplicity of the storing apparatus, the almost complete absence of heat and the entire and absolute freedom from accident—all these points were fully explained and thoroughly tested.

In the small compass of the battery used last night was stored power enough to furnish light in forty lamps for five hours and more, each light being of sixteen-candle power.

The test made was a convincing proof that power may be stored ready for use when demanded, and that electric light may be as readily applied to private dwellings as to streets or shops or public buildings.

The Brush-Swan system has triumphed over the obstacles that have hitherto stood in the way of the general use of electric lights, its lamps never varying and its light being demonstrated superior to that generated by any force. It is safe and yet a model of convenience, and since it is free from the dangers incident to some of the systems in use, it may confidently hope to claim for itself the honor of having demonstrated how electricity as a source of generating light may be brought into universal use. Already the Brush-Swan system has been for months in successful operation in New York City.

Electric Locomotion—Limitation of Speed.

BY ROBERT SABINE.

The available work of an electro-motor set to actuate any locomotive system would be expended in (1) accelerating the train; (2) the rolling pull; (3) adhesion of the contacts, and (4) resistance of the air.

The work expended in acceleration would probably in practice with an actual line fall out of consideration, because the lines entering stations would certainly be provided with inclines for retarding the trains before arresting them, and these or similar inclines would be taken advantage of to accelerate the outgoing trains at the expense of the work stored up in stopping them instead of at the expense of the current.

The rolling pull with a well-constructed electric train should not exceed that of a railway train; but when the current is on the motor there will be a drag caused by adhesion of the contacts slightly increasing the apparent rolling pull.

On a level road it is probable that these two items might amount to 10 pounds per ton. When a certain speed is exceeded the heaviest item is the resistance of the air. When a flat vertical surface is set up at right angles to the direction of the wind the pressure upon it is directly proportional to its area, and also to the square of the velocity of the wind.

The same rule holds good if the air is still, and the flat vertical surface is moved forward with the same velocity.

When the velocity is ten miles an hour the air-pressure upon each square foot standing normal to the direction of the motion is only ¼ pound. But at a speed of 50 miles an hour—that of an express railway train—the pressure upon each such square foot is 12½ pounds. And if the speed could be increased to 150 miles an hour, the air-pressure per square foot would be 1 cwt., while a speed of 200 miles per hour would have to be attained against an air-pressure of nearly 200 pounds per square foot.

This air-pressure multiplied by the number of feet through which the train travels in 1 minute gives the foot pounds of work required to overcome the air-pressure.

In the following table this is given in the last column in horse-power:

SPEED IN		Horse-Power for air-pressure per square foot of effective surface.
Miles Per Hour.	Feet Per Minute.	
10	880	0.01
15	1,320	0.04
20	1,760	0.09
25	2,200	0.18
50	4,400	1.5
75	6,600	5.0
100	8,800	11.8
150	13,200	39.6
200	17,600	94.0

We see, therefore, that with a train presenting a flat face and ruuning at a speed of 50 miles an hour the air resistance absorbed per square foot would be 1.5-horse power; at 100 miles it would absorb nearly 12-horse power; while at 200 miles it would absorb 94-horse power per square foot.

Now, of course, a train intended to run at a high velocity would not be provided with a but-end, which would be the worst possible form to travel quickly; but it would be tapered off to cut through the air with the least possible resistance.

But it would probably not be possible to taper this so much as to make the resistance of the air less than equivalent to that of one square foot of flat surface.

Assuming this to be the case, we should have to arrange the motor to provide a spare 1½-horse power for air-resistance if driving at 50 miles an hour, which might be convenient enough; but I doubt whether the extra 12-horse power, which would be necessary to be provided for driving at 100 miles per hour, might not, even with the best of the present motors, entail considerable difficulty, while the extra 100-horse power for air-resistance with a speed of 200 miles an hour would be out of the question altogether.

Wachusett Electric Light Company.

FITCHBURG, MASS., COMES TO THE FRONT—FALL IN LINE WITH BOSTON, LOWELL, HARTFORD AND PROVIDENCE.

The formal opening of the Wachusett Electric Light Company's new station on Water street was on Wednesday evening, June 28th.

A good number of invited persons were present, says the Fitchburg *Daily Sentinel*, including several members of the city council and prominent merchants. Manager Ross and his obliging assistants explained the working of the machinery and conducted the visitors through the new apartments of the building. Great improvement has been made in the external and internal appearance of the structure, which was built for a boiler house and engine room for the Fitchburg Lumber Company. The building was the best obtainable for the purpose, being solidly built. It is essential that the machinery run steadily, for the least possible tremor about the building, as any irregular motion, manifests itself by unsteady light. The engine rests on a solid granite foundation, and the timbers upon which the dynamo-electric machines rest is supported by walls of solid masonry. The engine runs nearly as steadily as a chronometer and the machinery causes the least perceptible tremor. The perfect working of the engine and

dynamo-electric machines won many compliments from spectators.

The engine-room is 16x31½ feet. The engine of 75-horse power was built by the Fitchburg Steam Engine Company, and the foundation is laid for another engine of 100-horse power which will be connected with the fly-wheel shaft. The dynamo room is 13x31½ feet, and has a capacity for machines producing 250 lights. There are five dynamo-electric machines in operation and two more each with capacity to run 28 lights will be added in a few days.

The boiler-room, 10x31 feet, contains a boiler of 80-horse power and the foundation is laid for another boiler of 100-horse power. There is also a store room, 20x10 feet, for heavy supplies, and a store room, 10x34 feet, for line supplies.

On the second floor is a workshop, 18x18 feet; an office, 16½x18, occupying the front of this floor, and an electrical room, 16x18 feet. The company propose to remove their business office from the American House to this building in a few days. The station is supplied with city water and facilities are provided for pumping from the river, so that no accident to the city water works can interfere with work at the station.

Manager Ross has shown much energy in developing this enterprise. The company have a contract with the city for lighting Main street and parts of Lunenburg, Summer and Water streets. They have an independent line. At present there are three circuits and two more will be added.

After a thorough inspection of the station a score of invited guests partook of a sumptuous dinner at the Fitchburg Hotel. After-dinner speeches were made by Chief Engineer Reed, Dr. D. S. Woodworth.

The Application of Electricity to Medical Purposes.

In March of last year Drs. Stone and Kilner read a paper before the Society of Telegraph Engineers and of Electricians on "Measurements in the Medical Application of Electricity." This was not only interesting in itself, but also from the fact that it was, we believe, the first of its kind which has been brought before the notice of the Society. We had thought it more than probable that these practitioners would have submitted ere this a second contribution on electricity as applied to medical purposes. Such, however, has not been the case, but we notice that Dr Stone has supplemented to a certain extent the paper of which he was joint author with a short article in our contemporary *Nature*. We think this of sufficient interest to reproduce in our columns, and at the same time to call for some remarks.

Dr. Stone imagines that the temperature of the human body influences its electrical resistance, and this supposition is doubtless correct; but he goes further, and states his belief from his experiments that the resistance of the human body follows a similar thermal law to that influencing solid conductors, or, in other words, that increase of temperature augments the electrical resistance of the body, only in a much higher ratio than is the case with solid conductors. It would appear, however, if the figures given in *Nature* are correct, that Dr. Stone's tests contradict rather than tend to prove his views.

The resistance of the patient's legs from one foot to the other is given as 4,550 ohms, at a temperature of 102.4°; 4,780 ohms (mean) at a temperature of 104.2°, and 2,300 ohms at a temperature of 103°. These figures are so contradictory that it is not worth while commenting thereon beyond saying that even presuming the observations were correctly taken, single tests of such a character cannot be accepted as by any means conclusive or satisfactory. Again, the range of temperature—less than two degrees—is so small that an error could easily creep in; and as only a ten minutes' interval was allowed between three of the tests it does not follow that the temperature of the patient's body in all parts under treatment was that shown by the thermometer. Furthermore, the last test was made between three and four hours after those above referred to, and although Dr. Stone is careful to mention that the measuring apparatus was left untouched so as to prevent any accidental change, it seems difficult to imagine the patient to be as little liable to alteration as inert instruments, during such a lengthy period of rest. Indeed, it appears to us that the method of making the tests, the range of temperature noted, the contacts, are all open to the admission of errors. The late Sir Charles Wheatstone had a very pretty instrument which he employed in testing the resistance of liquids in which the electrodes used set up a counter-electromotive force. It was a battery and galvanometer reverser, both reversals taking place at the same time by turning a handle, and alternating many times in a second. Such an apparatus or a commutator for reversing the ends of the *measured* resistance, as is now universally adopted in the "Wheatstone Bridges" used in the post-office service, would be of use to Dr. Stone in his experiments.

Regarding this point, the Doctor mentions that to produce accurate results the battery was frequently reversed for fear of opposition currents of polarization. Such reversals, unless made after definite intervals and in such a way as to enable the measurements to be taken at the moment when polarization is eliminated (as is done in testing for the locality of a fault in a broken cable), are almost useless.

One other point in Dr. Stone's interesting but unsatisfactory paper may be drawn attention to; it is stated that in making contact between the body and the testing instruments Prof. Rosenthal has drawn attention to the high insulating powers of the epidermis. We think that herein, to a great extent, lies the secret of the great difference of resistance obtained by the experimenter with a temperature difference of say 1° or thereabouts. We most of us know the effect of keeping the feet in salt and water, or water alone, for any length of time. The skin turns white and swells, enlarging the pores, indeed nearly the whole of the outside skin is of a spongy nature. To this cause is doubtless due the decrease of resistance shown in the Doctor's last test; for, supposing that the patient did not keep his feet in the bath during the interval between measurements, his feet would be, during the last test, in a more porous condition, and therefore the skin of a less insulating nature than at the commencement of the observations.

If Dr. Stone continues his experiments upon various human subjects he will be doing real good by giving us at least an approximate idea of the average resistance between various parts of the human frame; this will be interesting to those engaged in electric lighting with systems which are considered somewhat dangerous to life; but so much depends upon the condition of the subject that it appears very doubtful whether any two persons would have the same resistance between any two given points.—*London Electrical Review.*

Picking Up Broken Cables.

The laying of telegraphic cables is now so common that the description of the machinery for picking up a broken one will be read with interest. It consists of a rope about an inch and a quarter in diameter, made from the strongest hemp, with interwoven wires of fine steel. The grapnel at the end is merely a solid shaft of iron some two feet long, and weighing about 100 pounds, and prolonged into six blunt hooks, which much resemble the partly closed fingers of the human hand. In picking up the cable in deep water, the Minia, after reaching the waters near the break, lets out her rope and grapnel, then takes a course at right angles to the cable and at some distance from the fracture, so that the broken ends may not slip through the grapnel. The grapnel rope is attached to a dynamometer, which exactly measures the strain on the rope, and shows unerringly when the cable has been caught. If the grapnel fouls a rock, the strain rises very suddenly to a high point; but the exact weight of the cable being known, the dynamometer signals by the steady rate of increase its hold on the cable far below. The case and certainty with which cables are picked up in these days is amazing. A while ago one of the lines of the Anglo-American Company was caught without trouble at a depth of two and a quarter miles near the middle of the Atlantic. Captain Trott, of the Minia, who has won great fame for his skill and ingenuity in cable matters, but recently picked up the French cable 180 miles off St. Pierre, and in four hours from the time the grapnel was let go had the cable spliced and in working condition. The splicing is a work of great delicacy and skill, and when accomplished by trained fingers the spliced part can scarcely be distinguished from the main cord.

The Money-Order System.

THE NEW SCHEDULE THAT WENT INTO EFFECT JULY 1ST—FOREIGN MONEY ORDERS.

In accordance with the provisions of the Act of Congress, affirmed March 3, 1883, on and after July 1st a single money order may be issued for any amount from one cent to $100 inclusive, but fractions of a cent must not be introduced with the amount of a money order. On and after to-day the fees to be charged the public for domestic money orders will be as follows:

Orders not exceeding $10	8 cents
Exceeding $10 and below $15	10 "
" $15 and below $30	15 "
" $30 and below $40	20 "
" $40 and below $50	25 "
" $50 and below $60	30 "
" $60 and below $70	35 "
" $70 and below $80	40 "
" $80 and below $100	45 "

Postmasters are instructed to refuse to issue in one day to the same remitter, and in favor of the same payee, more than three money orders payable at the same post-office. The fees upon international money orders remain unchanged; and the question of increasing the maximum limit of a single international money order to $100 (an increase requiring additional legislation) will hereafter be considered by the post-office.

In sending checks or drafts to our office, please omit the usual revenue stamp (or cent). The law repealing this tax went into effect on July 1st.

NEW HAVEN, CONN., July 6, 1883.

Editor of the Electrical Review:

SIR,—The hope that some practicable method would be invented by which telegraph and telephone wires could be laid underground has probably prevented experiments from being made to relieve the objections to the present system, especially in our cities. As something *must* soon be done in one way or the other, I would suggest what seems a feasible plan for carrying them through our city streets overhead.

The main objection to the pole system as at present used is the needless multiplication of poles, their insecurity, and unsightly appearance. If all the wires in use by all the companies were carried on the same supports much fewer would be necessary; but every company has its own set of poles and in our principal thoroughfares and groups of these are standing together, impeding the sidewalks, interferring with each other and forming most disagreeable disfigurements of the streets.

My proposition is that the cities in their municipal capacity, or a company to be incorporated in each for that purpose, shall construct a single system of permanent and lofty supports in the streets on which *all* the electric wires in use shall be required to pass. For this use the city would charge each company a rental, thus deriving a revenue from that source, and being itself under obligation to maintain the supports in good order.

The supports should be of iron not less than 50 feet high—consisting of two upright posts on opposite sides of the street with a series of horizontal connections across the street upon which horizontal bars the wires should rest, passing as much as possible along the center of the street line so as to be out of the way in fires. These supports would also answer for lamp posts, awning posts and even fire-escapes, and all the other uses for which uprights are needed in city streets. They should also be so constructed so as to answer for lightning rods to protect adjoining buildings. Being light and easily made somewhat ornamental, and placed at considerable distances apart, there is no reason why they should be in any way objectionable. They would also be a convenience to the electric companies as they would thus be relieved of all trouble and odium with respect to the setting up and maintenance of poles. That the proposed system would in some degree save our forests from destructive inroads would certainly be no objection to its adoption.

Respectfully, yours,

H. F. BLAKE.

The Lighting of the Public Garden, Boston.

A correspondent writes to the editor of the *Transcript:* "How is it that the electric light company which has the lighting of the Public Garden has been allowed to disfigure with so many poles and 'clothes lines,' if it is true, as I am told, that another company offered to light it at a lower price and to carry the wires underground? Also, why did they not put the same or a smaller number of lights at the top of two tall masts like that at the Institute Building, placing one at each end of the pond, thus securing a more general illumination, including the surrounding streets, and avoiding the dazzling and blinding effect produced by the present mode? The electric light is undoubtedly what we want, but we want the best and cheapest." To which President Goff replies as follows: "In your issue of last evening a correspondent asks several questions concerning the doings of the company which has the lighting of the Public Garden. As I understand it, the offer of another company to light the Garden, and put its wires underground, was declined by the city because the light offered did not come up to the standard, and because no underground system has as yet proved a success. The question of massing the lights on tall towers was considered by the committee, but it was decided that brilliant illumination of the *ground*, not of the *air*, was the thing wanted. Undoubtedly the city wants 'the best and the cheapest,' and, taking *quality* into account, that is what it is getting.

Yours truly, EDWARD H. GOFF,
Pres. Amer. Electric & Illuminating Co."

"Yes, sir," resumed the Dakota man, as a crowd of agriculturists seated themselves around a little table—"yes, sir, we do things on rather a sizable scale. I've seen a man on one of our big farms start out in the spring and plow a furrow until fall. Then he turned around and harvested back. We have some big farms up there, gentlemen. A friend of mine owned one on which he had to give a mortgage, and the mortgage was due on one end before they could get it recorded on the other. You see, it was laid off in counties." There was a murmur of astonishment, and the Dakota man continued. "Just before I left home, I got a letter from a man who lives in my orchard, and it had been three weeks getting to the dwelling-house, although it had traveled day and night."

"Distances are pretty wide up there, ain't they?" inquired one.

"Reasonably, reasonably," replied the Dakota man. "And the worst of it is, it breaks up families so. Two years ago, I saw a whole family prostrated with grief—women yelling, children howling, and dogs barking. One of my men had his camp-truck packed on seven four-mule teams, and he was around bidding everybody good-bye."

"Where was he going?" asked a listener.

"He was going half-way across the farm, to feed the pigs," replied the Dakota man."

It is stated that Henry Berwick, an employe of the Bethlehem Iron Works, has invented a sewing machine needle, for the exclusive use of which the Singer Company offers $30,000.

Telephonic.

Major Willis R. Warren, of the firm of Warren & Parsons, of London (formerly connected with the telegraph and telephone interests here), arrived on the steamship City of Rome on Saturday last. Major Warren returns for a short business visit, to look after his telephone and real estate interests. His friends gave him a lively reception, and entertained him handsomely at Delmonico's on Monday last. The Major never looked happier, and fortune seems to have smiled upon all his undertakings. We are glad to see his popularity so widely extended and appreciated.

J. H. Francis, an agent of the N. T. & P. Telephone Company, visited Cortland for the purpose of interesting the citizens in the building of a telegraph line from there to Ithaca. Should this line be built it will connect Cortland with Elmira, Binghamton, Owego, and several hundred towns south and west in this State and Pennsylvania. The citizens in the villages along the line of the U. I. & E. railroad, and also the Southern Central, have shown great interest in the construction of this line to Cortland, and have agreed to use the line if built to an extent that will insure its construction if the citizens of Cortland show the same anxiety to be connected with their neighbors. No village of the size of Cortland in the State is without telegraphic communication with adjacent towns and villages.

A Perry parrot talked through the new telephone between Perry and Warsaw, on the 29th, and the manager of the central office nearly tore himself bald-headed asking, "Who is it?" and "What d'ye say?" A good joke on the telephone man.

The American Bell Telephone Company shipped to its licensees 7,038 telephones during the month ending June 30th, 1883.

The Tropical Telephone Company is sending 500 sets of instruments to the United Telephone Company of the Argentine Republic, making 1,700 sets sent to South America. The United Company of the River Platte has a large and constantly growing business. The April receipts of the company were $5,000 in gold. There were added in April 101 subscribers, making 917 on the books of the company.

Southwestern Telegraph and Telephone Company.

DALLAS EXCHANGE, June 28, 1883.

Editor Electrical Review:

The telephone exchange in Dallas, Texas, is still on the increase. They have lines now to nine different towns, and are building to Ennis, Elvarado, Cleburne, Garrett, Italy, Millford, Midlothian, and others. The subscribers now number about 285.

Mr. D. M. Clower, the gentlemanly manager, has received a much-deserved promotion, and is now division superintendent of all that territory north of the 31st parallel, and west of longitude 97.

The exchange has made great progress since he took charge of it, having then about 105 subscribers, and at Christmas, 1882, 200, showing rapid growth.

The exchange has also been greatly benefitted by the time-signalling inventions of Mr. T. M. Oram. His first invention in this line was his noon signal, an apparatus which automatically rings every bells in the city at precisely noon every day.

Next comes the grandest time invention of this modern age. It is a small machine about eight inches square by two and one-half in height, and when attached to a certain wire from the switch-board converts every telephone in the city into a most exact chronometer, telling the exact time every minute in the day to within a fractional part of a second. Any subscriber can hear the exact time any minute in the day by simply placing the hand-phone to the ear. No need of ringing the office—the time is always there ready to be heard whenever you listen.

It only takes four cells of battery to run this machine for our office, and gives no trouble save looking after the batteries once in a few months.

We consider this the most useful invention of the present day; it is never-failing, and always can be heard and relied upon. Railroads, steamship lines, and all companies needing exact time to the second, can always rely upon this instrument to give them the exact time to set their chronometers by.

H. G.

Telephone Troubles in Wisconsin.

WIRES AND POLES CUT DOWN BY THE OSHKOSH AUTHORITIES—STOCKHOLDERS INDIGNANT—THE MATTER TO BE TAKEN INTO THE COURTS.

OSHKOSH, July 2.—At three o'clock P. M. Mayor Pratt ordered out the hook and ladder truck and chief of police, and proceeded to cut down the wires and poles of the Wisconsin Telephone Company, in accordance with the ordinance recently passed by the Council directing him to do so upon refusal of the company to pay $300 license exacted by the same ordinance. The cutting commenced near the central office, and fifty wires were cut down and the poles felled. By this time an immense assemblage of people had gathered, and great excitement prevailed. Public sentiment is about equally divided on the subject. After the wires had been removed for about one block, the line men of the company mounted to the top of the neighboring poles and defied the mayor and the chief of police to cut down poles with the men on top, which would certainly have killed the men had the poles been felled. No more poles were cut after that. The entire southern portion of the city and Milwaukee is cut off from communication, and the attorneys have been telegraphing all the afternoon to Superintendent Haskins at Milwaukee, and processes will probably be served to prevent further cutting, and take the case into court. The affair caused a big sensation.

INDIGNANT STOCKHOLDERS.

A telegram from Oshkosh, announcing that the work of demolishing the Wisconsin Telephone Company's wires had been commenced at that point, was received by the company's stockholders while in annual session yesterday, and was met by a storm of indignation. Various plans for operation were suggested and discussed, but no positive course decided upon. One proposed plan was to take the matter into the courts and there have it settled. Another was to raise the rental of telephones, to meet the additional expense of license, and thereby indirectly cause the pockets of patrons to staud the city license tax. A third idea was to withdraw the service from Oshkosh entirely, until the city reimbursed the company for all damage done, and guarantee a free and unobstructed right-of-way for lines. Which course will be pursued yet remains to be decided.

ORIGIN OF THE TROUBLE.

Secretary Haskins was seen and questioned relative to the trouble. He said: "The Common Council of Oshkosh first attempted to exact a city license of $500. This we plainly told them we would not pay, neither would we pay any license. Sooner than do so we would withdraw the exchange. The proposed license was then lowered to $300, and the Company notified that unless the amount be paid before a stated time the lines would be cut, etc. The designated time for paying the license passed some time since, and the matter has then stood up to this time. I am quite positive that the license will not be paid. The company is already paying a State tax, in lieu of all other taxes, and to pay the proposed license would take fully 20 per cent. of the company's net receipts from the exchange. The matter will undoubtedly be settled in the courts or the lines taken out of the city entirely. Should the company accede to the demand made by Oshkosh, every city wherein there is an exchange would adopt the same course."

The annual stockholders' meeting of the Wisconsin Telephone Company was held in the company's new quarters on Broadway on the 2d inst., directors elected and annual reports received. The directors of the past year were re-elected: C. H. Haskins, H. C. Haskins, E. H. Brodhead, B. K. Miller, and Albert Antisdel. The annual report shows the company to now have forty-two exchanges in the State, with 3,176 subscribers, and 1,000 miles of connecting lines between cities and towns. At a meeting of the newly-elected directors, the following officers were elected for the ensuing year: President, C. H. Haskins; Secretary, H. C. Haskins; Treasurer, F. G. Bigelow.

A wealthy citizen of Mauch Chunk has made a novel bequest to that town, of such utility that it deserves to be made known throughout the entire country. He has provided an electrical attachment by which the time of the clock in the telegraph office of the Lehigh Valley railway is struck on one of the large bells of the chime of St. Mark's church, and as the telegraph clock is regulated at noon daily, it is very easy for all the people of Mauch Chunk to have their timepieces correct. A time-ball has also been placed in the church, and it drops precisely at noon, after the manner of the time-ball on the Western Union building in this city. A similar attachment might advantageously be provided to strike the correct time in every town in the republic which has a telegraph office. Costly town clocks cannot be provided in many of the smaller villages, but the hours may be struck on church bells without costly clocks, if the Mauch Chunk electrical apparatus be employed. It will be a great convenience to a large part of the population of the entire country to have the time of the telegraph clocks struck on the bells nearest to them, and when a uniform system of time for the world is adopted, by means of electricity the clocks of each meridian can easily be made to tick in unison.

The Telephone Controversy.

To the Editor of the Rio News:

In the editorial comments with which you favor my letter of May 30th, stating the actual details connected with the recent seizure of telephones, you are led into making a variety of statements which have no foundation whatever in fact.

There can be no doubt that your interest "is simply that of an outside party, one of the great public" and this being the case there, of course, exists no motive for misleading the rest of this public. Permit me, therefore, to point out that what you censure without reserve, as actual occurrences, are of necessity known correctly only by actual participants, of whom the *Rio News* was not one; that second-hand information in such matters is not likely to be sufficiently correct to justify leading articles attacking the motives or actions of third parties; and that in the particular editorial alluded to the information furnished the *News* was almost exclusively false.

Allow me to correct the following erroneous statements in the editorial of the 5th of June.

1st. The Tropical American Company cannot issue "instructions" either to the writer or the Companhia Nacional. Its views were received by cable and due attention paid them. The "authority" of the former company does not extend to Brazil, nor did any telegram ever reach this city which implied that it did. It is no longer necessary to argue that the "Tropical Company did not authorize" the seizure; the writer's previous letter proved conclusively that they did not and could not have anything to do with it.

2nd. It is *not* a fact that the "agent" of the Tropical American Co. was "accredited" to any "local company" and he was *not* called upon to consult any one. This is a simple matter of record; and only those who have the written facts can pretend to judge it.

3rd. It is *not* a fact that the patents were obtained "secretly." It was notoriously more than once a subject of conversation, between the Tropical American Company's representative and the "local company," the latter denying the possibility of securing these patents and their value if secured.

4th. With the full papers furnished the representative of the Tropical American Co. before the writer, he denies that that representative was "instructed to do nothing" without consulting "the Companhia Telephonica." He was limited by no such absurd instructions.

5th. Col. Russell is *not* "the president of both the Continental and Tropical American Companies." He has no connection with the latter organization, and never had any—unless he is a shareholder.

6th. "This representative, Mr. Shute," did *not* "keep away from the Companhia Telephonica until after the patent privileges were granted, the Companhia Nacional is organized, and the legal transfers are made." To the personal knowledge of a dozen persons in the "Rua da Quitanda," and out of it, he daily visited that establishment, often two or three times a day while he was in Rio, both before and after the issue of the patents. What went on within is purely his own business. That he "kept away" simply is not true. As to his fate in the United States, he did not impress most people who met him as being a child, and no doubt can take care of himself before his "principals."

7th. This gentleman told the exact truth when he said that "all the rights of the Companhia Telephonica had been respected and guaranteed." They were, as can readily be verified by whoever has the right to the particulars and will take the trouble to request them. The papers for this seizure were not "in preparation" ten days, or two days, previous to his departure. It is the merest justice to say that Mr. Shute had no means of knowing the details of the measures adopted by the Companhia Nacional to enforce its rights. He certainly could not "interfere;" but in the telegram from Bahia to which you allude, he made wise recommendations which were unheeded.

8th. The telephones did *not* come "in the very same steamer which brought Mr. Shute to this city." They did not leave the United States until after he was in Brazil. He came on the Borghese; they on the Advance.

9th. The seizure was *not* "annulled on the grounds that the petition for it was made in bad faith, and that the judge had been deceived," nor is there anything on the whole records of the Court to give color to so monstrous an allegation. The seizure never was annulled at all, and although if it were, an appeal would certainly be made. As yet it has not left the original court.

The above are simple corrections of error in the information upon which the editorial of the *News* is founded. They are not matters of opinion, or judgment, but bare facts, matters of proof and not of discussion. One of the individuals assailed is no longer in this country, and pending the reply which he will naturally make, the writer has taken the liberty of answering reflections upon his character as groundless as they are uncalled for.

As to the two points which the writer did "not explain," one of them, "the duty of the Companhia Nacional" is a matter of opinion and therefore need not be discussed; the other, his actions as president of the Companhia Telephonica, can scarcely be a matter of public moment, and is not an affair in which any journal can possibly be interested, or about which it can have any legitimate information, and it certainly is not germane to the seizure of the telephones in dispute. It is, however, untrue that he ever "rejected" any modifications "just on the eve of his leaving the presidency of the Companhia Telephonica," and consequently untrue that "the latter were kept in ignorance of this transaction."

Those who want the facts connected with the writer's administration of that company, and have a right to ask them, can have them, privately or publicly as they choose. He does not propose to obtrude personal grievances on anybody uncalled for, at present any more than in the past.

Your obedient servant,

CHAS. PAUL MACKIE.

Rio, 7th June, 1883.

As to the general tenor of Mr. Mackie's

rejoinder it is sufficient to say that it is our rule to carefully avoid making changes or statements affecting persons without satisfactory proof or on trustworthy information.

If we err in details we are always ready to acknowledge corrections, but in no case can we admit the possibility of our being led into so unenviable position as that in which Mr. Mackie's sweeping contradictions apparently place us. That our position in this matter may not be misunderstood, and not from any desire to discuss the question further, we shall simply meet Mr. Mackie's "correction" (following their numerical order) with some of the proofs and information upon which our criticisms were made.

1st. At our personal solicitation Messrs. Phipps Bros. Co. have kindly permitted us to copy the following cablegram from the Tropical American Company, regarding the seizure, which was received May 26th, 1883, at 3.30 P. M.

"PHIPPS, Rio.

"Embargo unaurthorized. Have cabled Mackie to release TROPICAL COMPANY."

2d. The Companhia Telephonica holds a letter dated at the Tropical American Co's. offices, New York, January 27th, 1883, which was presented by Mr. Shute, in person, as his credentials. Mr. Shute's coming was preceded by a cablegram from New York, dated January 22, from which we make the following extract:

"Agent Tropical sails 27 to arrange matters. Will not make contracts with others before seeing you."

3d. We are informed at the offices of the Companhia Telephonica that Mr. Shute never mentioned the subject of taking out patents until after it was done. This, therefore, becomes a question of veracity, and need not be discussed.

4th. The same as 2nd.

5th. We have examined a letter dated Boston, April 27, 1883, and signed "H. S. Russell, President Tropical Am. T. Co.," the title being in Col. Russell's own handwriting. We offer also the following clipping from one of the leading electrical journals of New York:

THE TROPICAL AMERICAN TELEPHONE COMPANY.—The executive offices of this company are now in Boston. Mr. H. S Russell is president of the company, Mr. J. H. Howard vice-president, and Mr. Charles W. Jones secretary and treasurer.—*The Electrical World*, May 5.

6th, This is simply begging the question. We are perfectly well aware that Mr. Shute did call at the offices of the Companhia Telepehonica, but never on business. It is a well-known fact—and our information is perfectly trustworthy—that while Mr. Shute was telling the telephone people that he was "not feeling well," and was "awaiting instructions from home," he was quietly arranging matters for taking out patents and transferring them to other parties. A great part of his time was spent in Petropolis, as Mr. Mackie knows personally.

7th. This is what Mr. Mackie would call "a matter of opinion." If the first developments are fair samples of this "guarantee" then the Companhia Telephonica has very little to expect. As to the second point, our information is positive and trustworthy that the papers were in preparation ten days previous to Mr. Shute's departure. This, therefore, becomes another question of veracity, which we shall not discuss.

8th. On this point our statement was incorrect, but the correction lacks accuracy as well. The *Advance* cleared at Newport News March 14th, the *Borghese* arrived there March 19th and the *Advance* (with the telephones) April 11th, the patents were taken out April 21st, and the transfer to the Companhia Nacional was made April 30th.

9th. This is a correction of terms rather than of fact. A decision was made against Mr. Mackie on the grounds stated just at the time our article was written, but we were mistaken as to the appeal. Since then, we are informed, this same decision has been confirmed in the same court, and an appeal *has* been made to the *Relacao*.

These are the specific points in our statements which Mr. Mackie has selected for correction. Our readers will judge for themselves as to the remaining general corrections.

We must now beg to close the discussion on these points, as it has assumed a character wholly foreign to our purpose. It will be seen that our statements were not made without proofs or on false information, and it will not be denied that we are competent to judge just what affairs are fit for newspaper inquiry and opinion. From the documents examined and the information received, we are fully justified in the criticisms made. Still further, from the same and other sources of information, were we inclined to enter into this, we should be fully justified in asserting that this complication has in part grown out of one gigantic swindling speculation, of which Henry S. Russell is the head, and Judson Shute one of its agents. The organization of companies in Massachusetts, New York, and New Jersey, the complicated transfer of patents and privileges, the changes of offices, the making and breaking of contracts, and the multitude of transactions common to such crooked speculations, would warrant no other conclusion.

[For the REVIEW.]

ST. LOUIS, MO., July 6th, 1883.

From New York to the metropolis of Missouri there are several routes. Without any disparagement to the others, there can be no doubt that the routes via the Pennsylvania, and Pittsburg, Cincinnati, and St. Louis railroads, and the Vandalia line, is quick, prompt, and picturesque.

The picturesqueness is, however, monopolized by the eastern section, between Philadelphia and Pittsburg.

Arriving at Harrisburg—the ground made classical by the claims of Daniel Drawbaugh to the original inventorship of the telephone—the tourist has a chance for dinner, which may be partaken of at the Union Depot, 75 cents each, the viands offered being plentiful, but not notorious for neat and efficient service, or for cleanliness. Your correspondent recently made the trip, and knows whereof he affirms.

The next principal station is Altoona, where the St. Louis train stops for refreshments twenty minutes. This halt is only remarkable for the way in which the "oi polloi" are kept from the platform by a high picket fence, through which myriads of women, boys, and girls, apparently deriving their origin from every kingdom and nation and tongue and tribe under heaven, offered to the passengers mysterious sandwiches, leathery pie, pink lemonade, and other delicacies. Self-denial is, however, an exemplary virtue, and we resolutely declined these dainties.

Soon after leaving Altoona, and before nightfall, our train commenced the ascent of the eastern slope of the Allegheny mountains, and shortly the wonderful horse-shoe curve of Kittanning was past. Those who have only seen this curve upon the posters and time cards of the Pennsylvania Railroad, cannot even approximate the wonderful sweep round the head of the ravine which the road here makes, the road on one side of the shoe being absolutely parallel to but considerably higher than that on the other.

We arrived at Pittsburgh in the dead of the night, Columbus early in the morning, and at our destination, St. Louis, at 7.30, the second evening.

Before arriving at St. Louis, the resistless flood of the Mississippi had made itself plainly apparent in the waste of waters which covered everything except the railroad embankments on the Illinois side. Houses in many cases were floating, and their inhabitants approaching and leaving them by boat. The railroads themselves, in some cases, gave way; while those which remained were compelled to strengthen their embankments.

St. Louis itself is a city possessing a population of nearly 400,000. It is said that the people of St. Louis were so confident during the last census, that its population was greater than that of Chicago, that they could give no credence to the result when published giving Chicago a great many thousands to the good, alleging that Chicago had employed a counting board, or a joint high commission. And they, moreover, were so confident that a mistake had been made somewhere, that they took a second census of their own city, which settled the matter by making a lower total than the first.

The sights of St. Louis are few. The bridge over the Mississippi, which is of steel, and was built by Captain Eads, is the principal one, if we leave out the river itself, which in the humble opinion of the writer we cannot do. There are also nine pretty little parks; three big ones; one botanical garden, and one fair-ground, which also does duty as a fair zoological garden.

The business places are near the river, and the residences, of which there are some remarkably fine examples, are chiefly back on the hill. In addition to Catawba wine and imperial champagne, the principal straight drinks are iced tea, and Budweiser beer. The favorite mixed drink is the Missouri river water which is of the color of very strong chocolate.

It is very hard for the unsophisticated stranger from the east to believe that a bath in such an opaque fluid is conducive to that virtue, which many people think the Bible says is next to godliness. But St. Louis is not a bad place in which to spend a week by any means, provided you can choose the time. July is not the time.

For six successive days the temperature has reached 95° Fahr.

The telephonic interests of St. Louis and vicinity, are controlled by the Bell Telephone Co., of Missouri, of which E. A. Hitchcock is President; Geo. W. Fishback, Vice-President; John R. Lionberger, Treasurer; E. A. Smith, Secretary; and Geo. F. Durant, General Manager.

The executive office and principal central office are located at 417 Olive street, in the heart of the business section of the city, while three smaller central offices are located respectively at 606 Leffingwell avenue, 1214 Cass avenue, and Third and Rutgers street Between 1,200 and 1,300 subscribers are connected with these offices, more than 500 lines entering the Olive street office. Eight massive Kerite cables convey many of the wires for a considerable distance from this office.

The system employed in connection with nearly all the lines is the well-known Law system; and whatever its respective merits and demerits may be, it cannot be disputed that where it is employed apparatus and labor can both be maintained at a minimum. As to the success of its working, deponent sayeth not.

In the operating room eight young ladies attend to the telephonic wants of 500 or more subscribers.

St. Louis is one of the earliest exchanges, having been organized in April, 1878.

The business has steadily grown, and now is on a firm and successful basis; a large private line system is also operated in connection with it.

For a large exchange, the office force is probably the smallest to be found anywhere.

East St. Louis and Belleville, Illinois, are operated as branch offices, both being under the immediate supervision of Mr. Edward A. Woelk, lately of Springfield, Missouri.

VERITAS.

New Atlantic Cables.

TWO MORE LINES TO CONNECT EUROPE AND AMERICA.

Alderman Hadley, of London, after several weeks of negotiation in this country, has at length completed what he regards as most satisfactory arrangements for the laying and operation of a new cable line between England and America. The name of the new company is the American, British and Continental Cable Company, otherwise known as the "A., B. C." Cable Company. Its capital stock is £1,500,000, divided into 150,000 shares at £10 each. This has all been subscribed by English capitalists, who include some of the best-known and strongest financial men of England. The main office of the company will be in London. The objects of the association, as described in the articles of incorporation, are to establish communication between Sable Island and Belle Isle, and any other points that may be selected on the shores of the Dominion of Canada, and such points as may be chosen on the shores of Great Britain and the European Continent or elsewhere, and also between any points on the Pacific coast of the Dominion of Canada and Japan, China, Australia, and India. Although this colossal scheme contemplates girdling the earth, for the present, at least, operations will be confined to cable laying between England and America. The extensive powers conferred on the company are derived from a special act of Parliament, which, in addition to granting authority to land cables at any point on the shores of the Canadian Dominion, gives the right to connect the same with the lines of the Government or any other telegraph company. The early completion of the Canadian Pacific Railway, and the consequent and natural increase in emigration and trade will afford, it is believed, a great amount of business for the new company, and is, in fact, one of the inducements that has been held out to investors in the company's stock.

Two cables are proposed. One will start from a point to the north of Glasgow, Scotland, and land at Belle Isle, which is about 300 miles north of Heart's Content, Newfoundland, the landing point of the original Atlantic cable. By connection with the Canadian lines at this point direct communication will be established with every part of the Dominion. This will be known as the northerly route, and will be several hundred miles less in length than the southerly route, besides crossing no other cables. The southerly route will be established by laying a cable from Penzance, on Land's End, the most southerly point of England, to Sable Island, which is about 200 miles southeast of Halifax, Nova Scotia From thence to the easterly end of Long Island will be laid a connecting cable which will afford telegraphic communication direct between London and New York city. The land for the Long Island terminus has already been secured. The cables are now being manufactured at Henley's works, London. The work of laying them will begin in September next or the month following, and the company predicts that it will be completed during the present year. By a new process of manufacture, of which the company is the proprietor of the patent, the cost of the cable over the southern route is estimated at £650,000, including brokerage and every expense. The average cost of Atlantic cables has been about £1,600,000. The patent which enables the company to prepare so much cheaper a cable includes certain improvements by which copper wire of greater conductive power can be manufactured and a more permanent insulation secured. Landing rights have been secured by the company in France, Belgium and Holland, and the company promises to furnish the public and the commercial world with facilities for rapid communication, such as are now afforded by no other company. In the articles of agreement which Alderman Hadley has drawn up between the cable company and the American Telegraph Company, with which connection is to be made, it is stipulated that no pooling of earnings or combination with other cable companies shall take place.

Alderman Hadley, who is acting in behalf of the company, is at present the senior Alderman of the juniors in the London Common Council, and by virtue of that fact is in the direct line of promotion to the Lord Mayoralty of London town. In fact, his election to this office will occur in September, and he will be sworn in as Lord Mayor on the 8th of the following November.

NEW YORK, July 5, 1883.

Editor of the Electrical Review.

SIR,—In regard to the magnet which formed the subject of my last communication, I thought I stated the case correctly; it seems not, or I have been misunderstood.

I did not expect to have a magnet that would attract 100 yards, but I did mean a magnet that would raise a weight of iron 100 yards. Practically—suppose a magnet was left down, say 100 yards more or less, and it came within 5 or 10 feet of a weight of iron, would it attract at that distance? If not, be kind enough to state the positive figures according to the known laws of electricity.

I would be grateful for practical information. Please state if you adhere to the motor, or do think another would be better.

Please answer in your next, and

Deeply oblige,

WILLIAM SMITH,
152 E. Fiftieth street.

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, JULY 12, 1883.

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Incandescence Lighting vs. Gas Lighting.

The incandescence system of electric lighting from which so much is, not unreasonably, expected, is now, for the first time, being practically brought to the attention of capitalists. Capital is always timid, but if it can be once assured of fair returns, it flows easily and freely into popular enterprises. For some time past, under a mistaken notion that the incandescent system was only a scientific success some have shown an inclination to give it the cold shoulder; but now that several large and reputable companies, composed of practical business men, are showing their confidence in the system by putting large sums into installations, their brothers of the gold bags' guild both here and in Europe, are treading upon each other's heels in the struggle to invest their golden shekels.

Under these circumstances, therefore, all data bearing upon the subject is interesting at this time, and practical results and corrected estimates after the incandescence plant has been distributed, peculiarly so.

The installation at Nottingham, England, besides being on a grand scale, is superintended by men not only of large means but who have had great success in other fields of applied electricity, and, therefore, the conclusions they have reached with proper modifications to suit the different conditions which obtain here will, no doubt, prove interesting to American electricians and capitalists.

For the guidance and convenience of the corporation which is making the installation, a careful estimate working cost of the sixty thousand lamps required in the district which it is sought to light, is given. Upon the assumption that the lamps will burn 2,500 hours per year, the annual charges are estimated thus:

Depreciation and repairs of plant	$50,000
Coal 2¾ lb. per indicated horse-power at $2.50 per ton	48,425
Oil, waste, &c	4,100
Labor and superintendence	26,915
Water rate	2,500
Other rates and taxes	2,500
Office expenses	2,500
Renewal of Swan lamps at 50 cts. per thousand lamp hours	75,000
Interest at 6 per cent. on $1,100,000	66,000
Total	$277,940

The cost of sixty thousand gas jets, each burning five cubic feet per hour, with gas at 62½ cents per thousand feet, would be $468,750. By this it will be seen that in Nottingham the cost of an incandescent light would be much less than that of sustaining a gas jet.

The appendix to the estimate of the company making the installation, however, says:

"If instead of each lamp (gas or electric) burning 2,500 hours per year, two or three burning alternately make up the 2,500 hours, the result will not be altered, the electricity and gas being alike supplied by meter."

We must, however, inquire how many lamps may be expected to be demanded when another set is no longer required. A demand will naturally enough be made at the places of amusement for light, and the demand for light will be greater towards the end of the evening.

Here is the summary for a December day:

	HOURS.
Banks	1½
Offices	2
Mills and workshops morning and evening	4
Warehouses	2½
Shops	4½
Theaters	4
Houses	7
Streets	16

At midsummer this list would be dwindled to—

	HOURS.
Theaters	4
Houses	2
Streets	8

It is, of course, very difficult to strike the average time per lamp, but seeing that offices, mills, warehouses and shops will take the greater part of the supply, and that these are all closed on Sunday, it would seem that 1,225 instead of 2,500 hours per lamp would be an exceedingly liberal estimate.

Taking all this into consideration and making the changes in the table of annual charges which this calls for, a far different result is required. The depreciation and repairs remain the same, that is $50,000, the coal account would be halved, the petty stores reduced to about $3,000. The labor and supervision would be practically the same, for the machinery must be always running; but we will reduce this to $22,500. Rent, rates and taxes would be unaltered while the renewals of lamps at 3s. 3d. per 1,000 hours would be 12,187 lbs. The interest would likewise remain constant at 13,200 lbs.; hence the total would be 46,829 lbs., or 15.6s. per lamp, as against 15.69s. per gas jet for the same time, that is, gas and electricity would cost practically the same if an average use of 1,250 hours per lamp could be secured.

But, in reality this is all that should be attempted, and we think that those who commence to sell electric intensity for less than gas per candle-power make a great mistake. Candle-power for candle-power electricity is preferable to gas at the same price, and the public, when they become familiar with the incandescent system, are not likely to hesitate between them.

Results from Deprez's Experiments.

According to the French scientific press, M. Deprez is preparing for experiments in the transmission of power on a large scale.

We must record our satisfaction that this ingenious electrician has not permitted the grass to grow under his feet.

The success he scored last Winter in the machine shops of the *Chemin de fer du Nord* all the world has been apprised of, and every reputable electrician and scientist wishes him success in his further efforts in the same direction.

It is to be hoped that in the coming experiments, whether public or private, every precaution shall be taken to carefully note and check results, and, in our opinion, this work should be done by a committee of well-known and reputable experts. We say this advisedly, knowing that it has not heretofore been the practice. But it will be remembered that, when the English electricians had re-crossed the channel, they suddenly discovered that the claims made by M. Deprez were not capable of being sustained. They bellowed so loud about this, and so set each other on to howl, that it seemed at one time as though one loud, long, and dismal wail was going up through the fog and soot and smoke that usually hangs over the British metropolis. These croakers have finally been silenced, thanks to the good sense of M. Deprez in having his results verified. Thirty-two per cent. of the theoretical power of a steam engine can now, by M. Deprez's method, be transmitted over an ordinary wire 21⅔ miles.

Now, we will acknowledge, for the sake of argument, that this indicates a great loss of power while *in transitu*, and that, ordinarily, what power was recovered at the end of the second machine would prove very expensive. But, fortunately, there are many other sources of power than its generation through the combustion of wood and coal. There is the power generated by the running stream, the waterfall, and the ebbing and flowing and vertical rise and fall of the tides. Thus, let these once be utilized, and a percentage of loss such as that recorded by M. Deprez would be insignificant.

A method that will, no doubt, in the future prove popular at the sea-shore for driving a generator, will be tide-lock. Say that forty acres of marsh land is locked off with a tide-gate, such as is already in use for draining marshes. With two wheels and a six-foot fall, this would furnish sufficient power to run the shafting of ordinary manufactories, and could a part of it be transmitted, the sea might be made to operate the machinery of factories far inland.

If Deprez's experiments may readily be duplicated, there is reason to believe that in the not distant future rivers will be made to illuminate not only the district of country through which they flow, but to furnish light and power, and perhaps heat, too, to outlying districts of country, say included in a belt of thirty miles on either hand.

Again, the machines used for collecting and distributing power during the day could be employed at night in storing electric accumulators, and thus no power at all be wasted.

To what extraordinary future possibilities the improvements in the dynamo-electric machine, the storage battery, and the power-transmitting machines have opened the way!

Were stations established along the post-roads of this State to-day for the storing of accumulators with electrical power, one might get in his tricycle and ride hither and thither, with no danger of sick horses from over-driving, and at whatever speed was most agreeable.

Boats propelled by electricity could skim the rivers and the bay without coal bunkers or steam chests, and without those curses of steam yachting—smoke and flying cinders.

But aerial navigation is probably to be the most interesting problem of the future—a problem which has been attracting many to seek for its solution since the appearance of the storage battery.

A new steamship company is constructing a line of steamers which are to cross the Atlantic between Fort Pond Bay and the nearest point in five days; but who can say that, in the near future, it shall not be possible to cross the ocean in three days, or perhaps two and one-half, by means of a flying machine rendered buoyant by gas and propelled by electricity? Equally wonderful things have been done in the past.

"Women as Inventors."

Under this title Miss Matilda Joslyn Gage seeks in the *North American Review* to establish the thesis that inventive genius knows no sex unless it be to give a slight advantage to her own.

The paper is an interesting one; clearly written and timely, and though we should be delighted to learn that the world was indebted to the fair sex for all the valuable inventions cited by Miss Gage as well as for so many other ble-sings, we regret that candor compels us to be somewhat skeptical, and we trust we shall not be accused of a lack of gallantry if we dissect, in the cause of science, the claims put forward by the fair authoress.

It will be news to the cotton planters of Georgia, where Eli Whitney labored, and a revelation to his descendants at Westborough, Mass., where he was born, that Mrs. Greene, at whose house he lived while studying law in Georgia, was the real inventor of that invaluable mechanism, the cotton gin.

If Miss Gage had contented herself with the assertion that Mrs. Greene brought to the attention of the ingenious Whitney the necessity for a machine that would separate the seed from green seed cotton she would have said no more than the facts in the case gave her warrant for; but, when she attributes to her the absolute working out of the problem of mechanical separation she gives evidence of that peculiar quality possessed by many of her sex of asserting as a fact that which they would like to believe.

Let us look for a moment at the history of the cotton gin. Eli Whitney having been graduated from Yale College in 1792, went to Georgia to accept a tutorship, but finding that his place had been supplied, he accepted the invitation of the widow of Gen. Greene to make her house his home while studying law. Several little contrivances made for Mrs. Greene's convenience had given her a high opinion of his inventive powers; and when some gentlemen who were visiting her lamented that there could be no profit in the cultivation of the green seed cotton (the best variety) owing to the great difficulty of separating it from the seed, she advised them to apply to Mr. Whitney, "who," she said "could make anything." At this time a pound of green seed cotton was all that a

negro woman could clean in a day. Whitney had never seen either the raw cotton or the cotton seed. With some difficulty, as it was not the time of year for the cultivation of cotton, he procured some from which the seeds had not been removed, and began working out his idea of the cotton gin. For some months he was engaged in constructing his machine, in which he met with great difficulties, being compelled to draw his iron wire, as he could obtain none in Savannah, and to manufacture his own tools Mrs. Greene and Mr. Miller, who afterward became Whitney's partner, were the only persons permitted to see the machine; but rumors of it had gone through the State, and before it was quite finished the building in which it was placed was broken open by night and the machine carried off. Before Mr. Whitney could complete his model and obtain his patent, a number of machines based on his invention had been surreptitiously made and were in operation. Whitney went to Connecticut to manufacture his machines, and the States of South Carolina and North Carolina, after a careful examination of his claim to the invention, decided that it was valued; and in acknowledgment of his services presented him, the one with $50,000 and the other with a handsome percentage for the use of each machine, which the State itself collected and paid over.

In all the litigation growing out of the infringements upon his patent, Mrs. Greene never appeared as a claimant.

We will concede the claim made by Miss Gage in behalf of Isis, who taught to the "swart Egyptians" the art of bread-making of Signora Bessani, an Italian workwoman who discovered the stitch used for Venetian point lace, which was lost in the thirteenth century, and of Betsy Metcalf, who in 1798 made the first straw bonnet. But we must resolutely set ourselves against the claim she brings forward in support of the pretensions of a Mrs. Manning as the inventor of the American mower and reaper, and deny, again apologizing, that "a little school-girl" invented the gimlet-pointed screw.

The mower and reaper was suggested by the ancient Romans, but the first experiments tending toward practical results were made in Europe in the early part of the present century. For its general usefulness and present perfection the world has acknowledged its obligations to the genius and enterprise of American inventors. The names of Smith and Bell are more deservedly connected with the experimental working of this machine in England than those of their countrymen, Gladstones and Scott; and those of Hussey, McCormack, and Ketcham are deservedly more familiar to American farmers than that of Manning; whom, by the way, history describes as a man and not a woman, and in this corroborates the archives in the Patent Office in Washington, wherein the husband of the Mrs Manning referred to appears as the patentee of certain improvements in the mower and reaper.

Concerning the screw, the principle upon which the thread of screws is laid out was well understood by the ancients, and the method is given in the works of Pappus Alexandrinus, a Greek mathematician of the fourth century of our era. The world owes to woman its chiefest blessings, but amongst these may not be numbered inventive instinct.

Telephone Interference Case.

WASHINGTON, July 6.—A report has found circulation to the effect that the telephone interference case, which has been before the Patent Office authorities for more than a year, has been decided. Mr. J. B. Church, the Examiner of Interferences, said to-day that a decision had not yet been reached, but that the case would probably be decided in the course of two weeks.

The question of organizing a School of Electricity in the vicinity of New York City is at present being strongly agitated; and by the circular bearing on this subject, which we published in a recent issue, it will be seen that Menlo Park, N. J., is put prominently forward as a favorable location for such a school.

There is no doubt that Menlo Park would make a very desirable place for a college, so far as healthfulness and sentiment is concerned, but the main point, it would seem, in connection with the establishment of a School of Electricity, should be, Which is the location that will be most convenient for those who will be the most likely to avail themselves of the benefits of the School of Electricity?

We may partly answer this question by endeavoring to ascertain whence will come the students to fill such a college? Just as at present there are numbers of young men in this city in the service of the telegraph, telephone and printing companies, etc., who have arranged their hours of business so that they are enabled in their spare hours to attend universities and colleges of medicine, law, dentistry, divinity, etc., so, we think, it will be found that many of the students of an electrical college will come from the service of the electric light, the telegraph and telephone companies, in the ranks of which there are many aspiring young men, who would gladly avail themselves of an opportunity to acquire a complete knowledge of the science with which they are identified.

These young men could not wholly give up their present vocations to the study of electricity, which they would require to do if the school should be established outside of New York City, and it would certainly seem that the necessities of this class of prospective students should be considered.

It is very true also, we will admit, that many students would eventually come from the classes that now go to swell the ranks of the various colleges of learning throughout the country, but it cannot be urged that it would not be quite as convenient for those to attend a School of Electricity in New York City as outside of it; while, as we have shown, it would be practically impossible for the former class to attend outside of the city; and thus, if we are to have a School of Electricity in this vicinity calculated to do the greatest good to the greatest number, it would appear to be necessary that it should be located immediately in New York City, or at least within easy access thereof.

Fishing by Electricity.

According to a correspondent of the Philadelphia *Press*, the electrical apparatus of Professor Baird's expedition is very complete. The search light is one of the most novel of the wonderful inventions of the nineteenth century. It consists of three Edison electric lights of sixteen candle power each, inclosed in a hermetically-sealed glass case, which is surrounded by a glass globe, and capable of resisting the pressure of the water at a great depth. It is proposed to sink the lamp and illuminate the sea by turning on the light. This, it is expected, will attract the fish, and a net ten feet in diameter at its mouth, placed below the light, will be drawn at the proper time, and the unknown fish of the lower waters will be caught. "It is an improvement," said one of the officers of the ship, "on the method of the Indian, who searched the rivers at night time with a burning pine knot in the bow of his canoe, and a spear in his hand, but the idea is really stolen from him." Paymaster Read has the most perfect arrangements for his work. He will be able to photograph fish and shells, as soon as they are taken out of the water, by a vertical camera. This is necessary, as in some cases the air changes the form of some of the curiosities of the sea. The sea water will also be brought to the surface from any depth desired for analyzation. During the trip of the Albatross from Wilmington an arc light has been first successfully operated on an Edison circuit, and an invention has been completed for lighting the surface of the sea, which will be useful for signalling and for the prosecution of all kinds of work at night.

Electrical Notes.

The government of the Orange River Free State, South Africa, is about to construct a line of telegraph in the districts occupied by the Boers (the original Dutch colonists of the Cape), in which are included the cities of Bloemfontein, the capital of the Orange River Republic, Harrysmith, on the route of the Natal Colony, and Smithfield, where there exists a large commerce in wool with the colony of the Cape. The line will be about 286 miles long.

***

At Zurich, the National Exposition buildings are connected with the telephone system of the city. At Moscow, the palace and military administrations are now placed in communication by telephone.

***

Foremost among the scientific workmen of the age stands Capt. John Ericsson, and of all the achievements in scientific fields during the last quarter of a century, his performances, though well known, are perhaps the least talked about.

***

Little men upon discovering anything of value, blow their horns vociferously and demand public recognition; Ericsson, in the solitude of his modest dwelling in Beach street, New York, labors on in silence and without a herald from one achievement to another.

***

His solar engine, or mechanism for storing solar energy is so unique, so ingenious and perfect that it seems the conception of a mind far more comprehensive than that given to the ordinary mortal.

***

It cannot, nor was it intended, to compete with the steam-engine. Yet may it by no means be classed with discoveries of purely scientific value.

***

There are regions, as Upper Egypt for instance, where fuel and water are not to be had, and others where fuel is scarce or expensive. In such places the solar engine will be found to be invaluable.

***

Those who have not, perhaps, had either time or opportunity to examine this curious device might be led to suppose by its name that the solar engine could not be used at night or during thick or cloudy weather.

***

This, however, is not the case.

***

The solar engine is capable of storing up solar power not only sufficient to operate it when the sun is shining, but sufficient to last through an extended interval of cloudiness and darkness.

***

All who are at all conversant with history are aware, that Ericsson's invention, the Monitor, not only saved the day for the Union at Hampton Roads, but revolutionized modern naval warfare.

***

The great iron fleets of Europe to-day owe the origin of their design to that contrivance of Yankee ingenuity, for, although Ericsson was not born in America, he has lived here for nearly half a century, and it is in the spirit of progress begotton of republican institutions that his best work has been accomplished.

***

In 1837 Captain Ericsson towed the Admiralty barge down the Thames at the rate of seven knots (nautical miles) an hour with his propeller launch, and then waited patiently for months to see if they—the Admiralty—would adopt the oblique for the direct action in the propulsion of vessels.

***

With characteristic English stupidity, however, the board rejected the propeller on the ground that its position in the stern would interfere with the steering of a vessel.

***

Naturally enough, Ericsson, utterly disgusted, came to this country.

***

Here, from the very start, the value of his invention was appreciated, and it was shortly thereafter put into practical use, though, doubtless, the English are claiming it as their own discovery at this day.

***

During his residence in England, Ericsson had been much impressed with the question, which even at that time agitated the minds of English scientific men: "What will mankind do for motive power when the supply of coal is exhausted?"

***

Numerous experiments have been made by him with the view of discovering a method whereby solar heat could be utilized, and on his arrival in New York these experiments were continued with increased industry.

***

After many years of constant application and study, during which he invented the monitor, the steam fire-engine, and the caloric engine, Ericsson perfected his long sought-for solar engine.

***

If erected near the sea-board, where water is to be had, the solar engine will generate steam, and where water is not to be had, atmospheric air may be made the medium for transmitting the solar energy to the motor.

***

In recent experiments under a clear sun, the engine worked with perfect uniformity at a velocity of more than 200 revolutions per minute, and consumed at the stated rate only a part of the steam furnished by a solar steam generator intended for a larger engine.

***

Captain Ericsson says that he is ready to build solar engines of any power.

***

In the front parlor of his little house in Beach street a beautiful model of this engine rests upon a table.

***

Ericsson intends to offer the principle of the solar engine as a free gift to the world, and he has applied for a patent only for the purpose of protecting the public.

***

It is, in fact, a gift to posterity, for he does not expect that his invention can be made available in competition with machinery using combustibles.

***

When, however, artificial fuel is not to be had, his solar engine will, there is reason to believe, open new possibilities to human achievement.

The New Cable Company.

Alderman Hadley, of London, said recently that the dispatches from England throwing discredit upon the American, British and Continental Cable Company, in whose interests he is visiting this country, had evidently been instigated by enemies of the new company. The A., B. C. Company, he said had been organized by British capitalists, but was in no way connected with the cable schemes of last year. The new company had already given contracts for the making of the cables, and the work was going on at Henley. By October it was hoped that the work of laying the cables could be begun, and then it would be pushed as rapidly as possible. The stock of the company was being taken by American capitalists in New York, Boston, and other cities in satisfactory quantities, and the prospects of the enterprise were most excellent. At first, however, much opposition had been met with in introducing the new cable scheme in this city.

Telephone Stock Quotations, July 12th.

American Bell Telephone Company.....272
Bay State Telephone Company.....133
Central New York Telephone and Telegraph Company 105
Boston and Northern Telephone Company.....165
Empire State Telephone and Telegraph Company..... 200
Granite State Telephone Company.....
Hudson River Telephone and Telegraph Company.....110
Long Island and New Jersey Telephone Company.....114
Mexican Telephone Company.....
National Bell Telephone Company of Maine.....
New York and Pennsylvania Telephone Company..... 100
Northwestern Telephone Company.....
Southwestern Telephone Company..... 68
Suburban Telephone Company.....139
Southern Bell Telephone and Telegraph Company.....125
Tropical Telephone Company.....2¾
Central Union Telephone Company.....110
Iowa Union " " 102
Missouri and Kansas Telephone Co.....100
United Telephone Company (Kansas and Missouri)..... 97
Bell Telephone Company, of Missouri...165
Wisconsin Telegraph Company 120

List of Awards Made at the Railway Exposition.

Best key relay and sounder complete, silver medal, Western Electric Company.

Best display telegraph instruments and supplies, silver medal, Western Electric Company.

Best Electric signaling device for block or other signals, gold medal, Union Switch and Signal Company.

Best semaphore, silver medal, Union Switch and Signal Company.

Best semaphore lens, silver medal, Corning Glass Manufacturing Company, Adams & Westlake Manufacturing Company.

Best time-detector, electric clock, and register, silver medal, Western Electric Company.

Best file, "cast iron," silver medal, M. A. Howell.

Best fire-proof insulating, bronze medal, Chicago Insulating Company.

Best electric motor for stationary purposes, gold medal, United States Electric Light Company.

Best electric railway system, gold medal, Electric Railway Company of United States

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GARIEL, C. M.—Traite pratique d'Electricite, comprenant les applications aux Sciences et a l'Industrie, et notamment, a la physiologie, a la medicine, a la telegraphie, a l'eclairage electrique, a la galvanoplastie, a la meteorlogie, etc ; 140 illustrations, 8vo, paper. Paris, 1082..... $2.50

BLAVIER, E. E.—Nouveau traite de Telegraphic Electrique. Cours theorique et pratique a l'usage des fonctionnaires de l'administration des lignes telegraphiques des ingenieurs, constructeurs, inventors, employes des chemin de fer, etc. Two volumes, 8vo, paper, 413 engravings. Paris, 1867..... ..$10.00

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NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 19, 1883.

FOR THE WEEK ENDING JUNE 19, 1883.

279,730 Alarm for printing telegraphs; Stephen D. Field, New York, N. Y.
279,629 District signal and messenger call box; Eugene H. Applegate, Washington, D. C.
279,517 Electric-arc lamp; Henry Ansot, New York, N. Y.
279,634 Electric-circuit cut-out; A. Livingstone Bogart, Jamaica, N. Y.
279,824 Electric-arc lamp; Robert J. Sheehy, New York, N. Y.
10,344 Electrical insulator; Demetrius M. Seward, Cincinnati, Ohio.
276,881 Electro-galvanic belt; Geo. E. Palmer, Boston, Mass
279,872 Galvanic battery; Theodore L. Kauffer and James Serson, Boston, Mass.
279,811 Incandescent lamp; Charles Richter, Camden, N. J.
279,712-3-4-5 Protector for telegraphic and telephonic instruments; M. Daniel Connolly, Philadelphia, Pa. (4 patents).
279,729, 279,865 Printing telegraph; Stephen D. Field, New York, N. Y. (2 patents.)
279,550 Printing telegraph; Samuel V. Essick, Alliance, Ohio,
279,557 Plug for electrical switch-boards; Edward Flint, Jr., Boston, Mass.
279,839 Secondary electric battery; Eli T. Starr, Philadelphia, Pa.
279,670 Telegraphic repeater; Joseph P. Smithers, Brooklyn, N. Y.
279,747 Telephone swittch-board; Everlyn B. Hamlin, Chicago, Ill
279,64 Underground system of laying electrical conductors; James E. Hamilton, New York, N. Y.

FOR THE WEEK ENDING JUNE 26, 1883.

279,977 Conduit for electric wires; Sidney Parker, Chicago, Ill.,
280,288 Commutator for dynamo-electric machines; Frank M. Brown, Boston, and Charles B. Bosworth, Everett, Mass.
280,028 Duplex and multiplex telegraphy; Geo. St. Gardanier, Brooklyn, N. Y.
280,039 Dynamo-electric machine; John Hopkinson and Alexander Muirhead, Westminster, England.
280,301 Dynamo-electric generator; Israel Fisher, Medford, Mass.
279,929 Electric railway signal; Dewitt C. Farrington, Lowell, Mass.
279,934 Electric arc lamp; Franz S. Giel, Brooklyn, N. Y.
280,046 Electrical pilot-car for locomotives; Smith H. Knapp, and Alpheus E. Adams, Danbury, Conn.
280,077 Electrical type-writer; John A. Parks and George V. Sheffield, New York, N. Y.
280,158 Insulated electric conductor; George S. Eaton, Brooklyn, N. Y.
279,946 Telephonic annunciator, Frederick C. Hazlett, Freeport, Ill.

ÆRIAL NAVIGATION.—He would not be considered of an unnsually sanguine temperament who should, in these days, look forward to a not distant future of ærial navigation. For the perfection, or rather the improvement, of the storage battery has made that feasible which heretofore has been justly looked upon as of but doubtful promise. It has been an easy matter to construct balloons of great buoyancy, but no one has thus far been successful in entirely controlling their movements when set free in the sea of ether above us. The introduction of the storage battery into the problem, however, will tend, there is reason to believe, toward an early solution.

The American Electrical Review.

The Review of the Telegraph and the Telephone has changed its name to the ELECTRICAL REVIEW, and is now published weekly instead of semi-monthly as formerly. It is somewhat enlarged in size, and is still edited by Mr. George Worthington.—*Trübner's American European and Oriental Literary Record.*

Manufacturing News.

The Altoona Rolling Mill will start up on full time next week.

A large iron furnace is among the enterprises contemplated by Tyrone, Pa., capitalists.

Mr. W. H. Stuckey, of Covington, Ky., has patented a fire-escape adapted to be secured to the wall of a building, and provided with an electric appliance by which a latch is raised and the fire-escape released, and put in position for use.

Mr. Lewis E. Williams, of Peekskill, N. Y., is the patentee of an improved burglar-alarm and door bell, in which a gong is attached to the lock-spindle inside of the house, so that the turning of the knob to open the doors at the same time operates the hammer and sounds the alarm.

A practical time signal for signaling standard time simultaneously over a series of telephone circuits has been patented by Mr. John M. Oram, of Dallas, Texas. This time signaling instrument is provided with several sets of contacts and with two or more conductors of electricity upon the same actuating arbor, each of which is insulated from the other and connected with an independent generator.

Notice has been given by the United States Rolling Stock Company to contractors inviting proposals for the construction of new works near Pullman. As we believe it is the intention of the company to invest something like $1,000,000 in one of the most complete establishments of the country and a new model manufacturing town, the progress of these works will be watched with interest.

The manufacture of basic pig for steel-making is extending in Cleveland, Eng. Messrs. B. Samuelson & Co. are already making it, and have bought up almost all the forge-tap cinder produced in the neighborhood. This they charge into the blast furnace, together with the magniferous ores from Spain and elsewhere. Tap-cinder, which hitherto has been quite a drug, is now becoming quite in demand.

There are five blast furnaces in operation in and around Birmingham, Ala., and the building of five more will soon be completed. The production is now 865 tons of pig iron daily in the iron district, or 315,725 tons per year, which, multiplied by the market price of $20 per ton, gives $6,314,500 as the value of the pig iron made in Alabama, to which may be added the value of the coal, making a total of $7,605,675 for the past year, and which is on the increase. It is now proposed to open several new coal-beds and build new furnaces as soon as the railroads will furnish the transportation facilities.

A dispatch from Kewanee (June 27) states that a movement had been on foot in that city to raise money to buy grounds for a rolling and pipe mill company which propose to locate there for the manufacture of bar iron and of wrought iron steam and gas pipes. If necessary lands were to be furnished by the citizens, and at a meeting last night the whole amount (about $20,000) was subscribed. The land furnished is five acres now occupied by residences, adjoining that occupied by the Haxton Steam Heater Company, and the new company will be operated in connection with that company. Work will be commenced at once on the building and pushed to completion as rapidly as possible.—*Chicago Journal of Commerce.*

"A woman's devilish deed," is the heading of an article in an exchange. We haven't read it, but we suspect the editor's wife has been putting up a new clothes-line, and that night the editor has come home late in the and hung himself up on it by the chin.

BUSINESS NOTICES.

NEW YORK, July 9th, 1883.

GEO. WORTHINGTON:

Dear Sir,—Will you please put in your paper the following:

Members of the New York Electrical Society can get books (the library being now circulating) from the Librarian at Hall No. 2, Cooper Union, City.

I also enclose a condensation of the rules, which you can put in if you see fit.

Yours respectfully,

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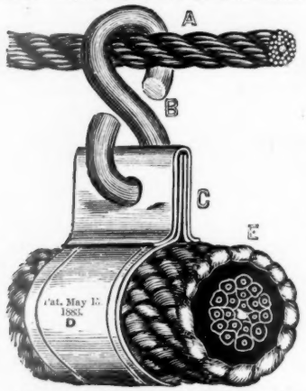

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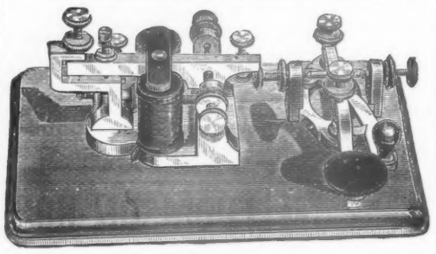

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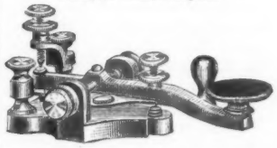

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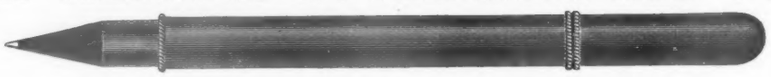

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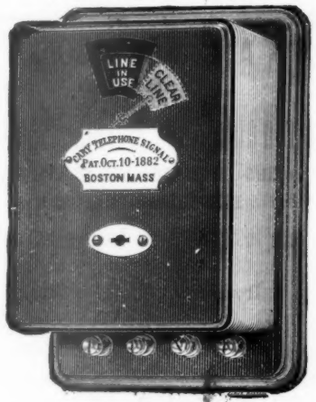

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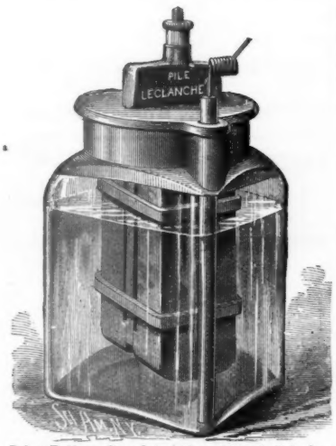

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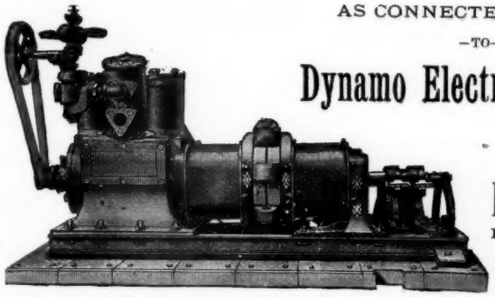

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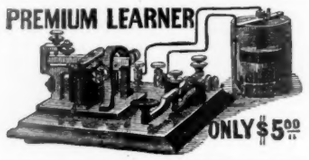

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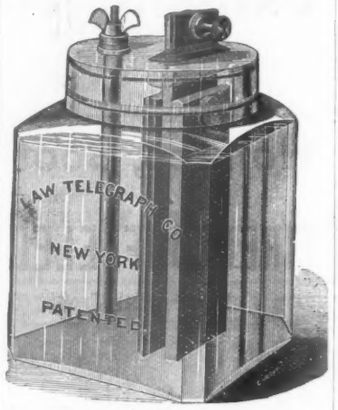

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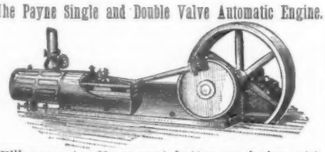
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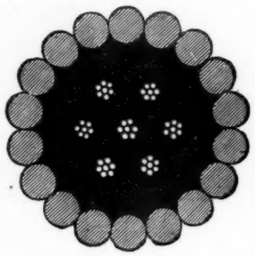

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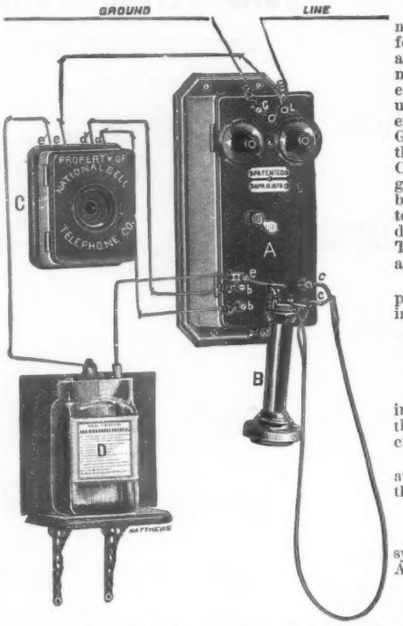

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